October 1979
(Purchase Order 40-9AD6-9-811)

Ecological Survey of the Vegetation of the proposed Trelorita Research Natural Area, Shasta-Trinity National Forest, Trinity County, California

Report to the R5/PSW
Research Natural Area Committee, U.S. Forest Service

D.W. Taylor and K.A. Teare
Botany Department
University of California
Davis, CA 95616

Table of Contents

	Page
Abstract	2
Introduction	2
Location	2
Area Boundaries	2
Physiography	2
Regional Climate	4
Geology and Soils	5
Vegetation	6
Regional Vegetation Patterns	6
Survey Methods	7
Plant Associations	8
Forest Cover Types	21
Conclusions and Recommendations	21
Plant Species List	25
Regional Map	40
Location Map	41
Topographic Map	42
Climatic Summary Table-Big Bar Station	43
Riparian and seep Association Table	44
Forest vegetation Association Table	45
Rocky site vegetation Association Table	46
Forest vegetation plot summary statistics	47
Figure 1: Generalized relationships of major vegetation types	50
Appendix 1: Forest Plot data	51
Appendix 2: Formal Nomenclature of plant associations	58
Appendix 3: Summary of climatic data for the Big Bar station	61
Appendix 4: Plant specimen voucher information	62
Appendix 5: Summary table of forest statistics	63

ABSTRACT

The proposed Trelorita Research Natural Area is located in the drainage of Manzanita Creek, a minor order tributary of the Trinity River. The area is under consideration for reclassification to Research Natural Area status by the Forest Service, U. S. Department of Agriculture. This report describes the ecological setting of the proposed Research Natural Area in relation to local gradients of vegetation composition.

INTRODUCTION

Location. The proposed Trelorita Research Natural Area is located in the drainage of Manzanita Creek, which is a minor order stream entering the Trinity River near Big Bar, Trinity County, California ($40^{o}45'N,123^{o}15'W$, see Maps 1 & 2). The proposed Research Natural Area is bounded by Treloar Ridge on the west and Manzanita Ridge on the east. The proposed Research Natural Area is given the name Trelorita as a corruption of the two latter named geographic features. The area encompasses ca. 2500 ha, and includes portions of Sections 9, 10, 11, 14, 15, 16, 19, 22, 23, 26, 27, 28, 32, 33 and 34 of T34N, R12W, and Sections 33, 34 and 35 of T35N, R12W, M.D.M..

Physiography. Elevations within the proposed Research Natural Area range from 365 m (1200 ft) at Big Bar to 1808 m (5932 ft) at the headwaters of Manzanita Creek on the northwest summit of Twin Sisters Mountain. The average gradient within the Manzanita Creek basin is 56 m/km as estimated along the creekbed. Slopes in the Manzanita Creek basin are generally very steep, averaging from 20 to 40 degrees. There are a few minor terraces of only a few degrees slope along the bottom of the drainage at the 450-500 m level. The ridges bordering the basin are not so narrow

that broad flat summits occur (to 300 m wide), and are rounded in form, so that small areas of lesser relief are found.

Manzanita Creek is a flowing stream in the dry summer months below about 900 m altitude. There is a gauging station located on the lower third of the creek which is maintained by the Big Bar District, Shasta-Trinity National Forest. The minor tributaries of Manzanita Creek are either ephemeral, or are maintained at very low flows in the summer months by seepage. Several springs occur in the basin. Trimble Spring is located in the W½ of the SE¼ of Section 34 of T34N,R12W. It flows in the summer months and is not shown on the U.S. Geological Survey Helena Quadrangle. It is accessible via jeep road. Two major seeps occur on the NE face of the SW peak of Twin Sisters Mountain at the 1600 m level (5300 ft) in the NE¼ of the NW¼ of Section 3, T34N,R12W. These are not shown on local maps (cf. Maps 2 & 3).

The proposed Trelorita Research Natural Area is accessible via trail along an old ditch system from the Big Bar Ranger Station. This ditch system is long abandoned, but does provide easy access to the lower reaches of the Manzanita Creek drainage (ca. 1500 ft elevation). A more obscure trail continues up the drainage to about the 2500 ft level, where a small corral and primitive log structure are found, being apparently associated with a minor grazing operation. The ridges bordering the Manzanita Creek drainage are traversed by trails (cf. Map 2). Treloar Ridge trail is not maintained and obscure to follow. Manzanita Ridge trail is a steep four-wheel drive vehicle road which runs 9.1 road miles N from Big Flat Campground and ends on the saddle 1.5 linear miles SE of Twin Sisters Mountain in the NW¼ of Section 2, T34N,R12W. The trail from this point to either the Buck Spring area across the S face of Twin Sisters

Mountain or to Mosquito Hollow nearby are likewise obscure and are not easy to follow, but can still be detected on the 1975 aerial photography.

Regional Climate. The headwaters of the Trinity River in the vicinity of the Manzanita Creek drainage transect a steep regional climatic gradient (Major 1977). More coastal areas are zonally more mesic than the study area. The Manzanita Creek area receives heavy rainfall from November thru March. Snowfall is only a minor component of the precipitation at lower altitudes, but increases greatly in proportion at higher altitudes. Snowfall at the 1300+ m level in the Manzanita Creek drainage is probably considerable, as indicated by evidence of past wet-snow avalanching from the summit and surrounding ridges of Twin Sisters Mountain.

Table 1 gives a mean monthly climatic summary of the available record from the Big Bar Ranger Station for the period 1953-1978, with the drought years 1976-1977 excluded (U.S. Dept. of Commerce 1953-1978). The mean temperature at Big Bar is 13.4 ^{o}C (56 ^{o}F), with a mean annual rainfall of 1018 mm (40 inches). Table 1 also gives an estimated mean monthly climatic water balance (cf. Major 1977) using the Big Bar data assuming 100 mm of soil moisture storage capacity. Potential Evapotranspiration (PE in Table 1) is estimated at 745 mm/yr (29.6 inches/yr), while Actual Evapotranspiration (AE Table 1) is 353 mm/yr (13.8 inches/yr). Thus summer drought, which could limit primary productivity, is great, ammounting to 392 mm/yr (15.4 inches/yr). Because of the generally steep lapse rates of precipitation and temperature with altitude, and because of the more sheltered location of the Big Bar station in the deep Trinity River canyon, summer drought can be assumed to be zonally much less at higher altitudes.

Slope exposure effects can amplify these mesoscale climatic differences, so that northerly facing slopes which are exposed to the westerly wind/ storm track can actually be quite mesic and primary productivity is not as limited as would be indicated from Table 1.

The years of record summarized for the Big Bar station are listed, along with the appropriate variance statistics, in Appendix 3. It will be noted that February and December temperatures exibit the largest year to year variance at this locality. Variance in fall precipitation is higher than variance in winter precipitation. Variance in precipitation in February is greater than either January or March.

There is a storage precipitation gauge located in the lower reaches of the Manzanita Creek drainage operated by the Big Bar District, U. S. Forest Service.

Geology and Soils. The proposed Trelorita Research Natural area is underlain by Pre-Cretaceous metamorphic rocks (indicated PCm in Tables 2,3, and 4), which, for the most part, are non-calcareous. The upper portion of the Manzanita Creek drainage is cut by a fault trending NW-SE which separates the Pre-Cretaceous metamorphics of the lower basin from metavolcanics of the same relative age in the upper basin. Twin Sisters Mountain is underlain mostly by these metavolcanic rocks. Along the fault line mentioned are slivers of ultrabasic intrusive rock, with serpentine being evident along the contact zone in two ridgetop localities. Geology in the vicinity of the Manzanita Creek drainage is mapped at a scale of 1:125,000 on the Redding sheet (Cal. Div. Mines & Geol. 1962), and the Helena Quadrangle at 1:62,500 (Cox 1956).

Published soil descriptions for the vicinity of the study area are not available. Gowans et al. (1967) provide typification of the soil associations in nearby Tehama County. Three of the mountain soil assocations of Gowans et al. are probably similar to those of the study area. The Sheetiron-Josephine soil association develops over hard sedimentary rocks, and are moderately deep, steep or very steep stony soils. The Henneke-Stonyford soil association develops over volcanic rock, and are moderately deep, steep or very steep stony soils. The Dubakella-Neuns soil association are also moderately deep or deep, steep or very steep stony soils which develop over partially altered volcanic rocks.

Soil-Vegetation mapping is likewise not available for the vicinity of the study area (Colwell 1977), although such mapping has been undertaken for neaby areas of western Shasta County (Mallory et al. 1968, 1973) and on the Orleans district of the Six Rivers National Forest (Rockey et. al. 1966).

VEGETATION

Regional Vegetation. No systematic ecological classification of the vegetation of the North Coast Ranges of California (where the Manzanita Creek drainage is located) is available. The region has a rich vascular flora (Raven and Axelrod 1978), and is the most diverse coniferous forest in North America (Axelrod 1976). Whittaker (1960) described the vegetation gradients to the north of the study area in the more mesic and more diverse Siskiyou Mountains. Waring and Major (1964) provide a direct ordination of the vegetation typical of a site closer to the Pacific Coast than the Manzanita Creek area.

Sawyer et al (1977) and Sawyer and Thornburgh (1969 - 1974) review the available literature on the regional vegetation in this area. In general, the Manzanita Creek drainage lies to the south of the more diverse vegetation types in the Klamath-Siskiyou mountains.

Ferlatte (1974) provides a flora for the nearby Trinity Alps, but since his scope only includes montane and higher habitats, many of the plant species found in the Manzanita Creek drainage are excluded. Muth's (1978) plant checklist is a more inclusive treatment.

Survey Methods. We visited the Manzanita Creek drainage on September 7-12, 1979. At that time we sampled 26 plots and 44 releves. Releves were summary lists made in representative habitat types (see Mueller-Dombois and Ellenberg 1974): each taxon in a homogeneous area of vegetation was enumerated, and cover was estimated visually in the following cover classes: greater than 75% cover = 5; 50-75% cover = 4; 25-50% cover = 3; 5-25% cover = 2; 1-5% cover = 1; less than 1% cover but numerous individuals = +; few individuals of low cover = R. These cover/abundance data form the data entries in Tables 2-4 to follow. At selected stands of forest vegetation, 10 m radius circular plots were established. Diameter of all tree species was measured to the nearest .1 cm at 1.37 m above ground (D.B.H.). A releve was also made at each sample plot locality. The releve data was coded and recorded on punch cards for analysis. Association Tables (Tables 2-4) were ordered using the algorithm of Ceska and Roemer (1971) as modified by Taylor (1976). Units of vegetation (associations) were delimited from this arranged primary data matrix. The stand data was similarly reduced by computer.

Appendix 1 gives the summarized data for each plot. Basal Area (m^2/ha), Relative Dominance(proportion total Basal Area), Density (stems/ha), Relative Density (proportion total density), Importance Value (Relative Dominance + Relative Density) and mean stem diameter (cm) were calculated.

A general reconnaissance was planned for the Manzanita Creek drainage from inspecting geologic and topographic maps, and from aerial photography. An attempt was made to visit all mesoscale habitat types in the basin, to note the plant taxa present. Careful attention was paid to the higher elevations on the slopes of Twin Sisters Mountain which was suspected to harbour potential subalpine taxa. Field collections of unknown taxa were made, and those indicated in the Plant Species List were deposited in DAV, with some duplicates in HSU and COLO. Most all mesoscale habitats in the Manzanita Creek drainage were visited. The seeps located on the NE face of SW Twin Sisters Mountain were not reached due to an unplanned escapade when the senior author was stranded in 3 m tall brush (Quercus vaccinifolia et alia) on a 40° slope. These seeps probably have interesting plants. Other species would be added to the species list for the basin by a spring visit.

Plant Associations. The 70 releves sampled were organized by tabular association analysis as shown in Tables 2-4, to identify groups of species which reoccur together under similar conditions in the habitat. From this arranged matrix, 17 associations can be recognized based on the presence-absence of the grouped taxa. These 17 vegetation associations are related in hierarchical fashion as follows:

A. Alnus rhombifolia-Peltiphyllum peltatum Alliance (Table 2)

1. Alnus rhombifolia-Cornus sessilis Association (SAF 221)
2. Alnus rhombifolia-Cornus stolonifera Association

B. Pinus sabiniana Alliance (SAF 250)(Table 3)

3. Pinus sabiniana-Cercis occidentalis Association (SAF 250)
4. Ceanothus cuneatus Association

C. Pseudotsuga menziesii Alliance

5. Quercus garryana Association (SAF 233)
6. Pseudotsuga menziesii-Quercus chrysolepis Association (SAF 243?)
7. Pinus ponderosa-Quercus kelloggii Association (SAF 245)

D. Abies concolor Alliance

8. Pseudotsuga menziesii-Cornus nuttallii Association (SAF 249)
9. Abies concolor-Pseudotsuga menziesii Association (SAF 243)
10. Abies concolor-Acer glabrum association (SAF 211)
11. Abies concolor Association (SAF 211)
12. Pinus attenuata-Quercus vaccinifolia Assoiation (SAF 248)
13. Salix jepsonii-Paxistima myrsinites Association

E. Quercus vaccinifolia Alliance

14. Cercocarpus betuloides macrourus Association
15. Holodiscus microphyllus-Penstemon corymbosus Association

F. Holodiscus microphyllus-Penstemon corymbosus Alliance

16. Holodiscus microphyllus-Silene grayi Association
17. Holodiscus microphyllus-Lewisia cotyledon heckneri Association

Readers unfamiliar with the most recent synecological literature may not be familiar with the theory of vegetation classification in a hierarichal scheme as employed here, as it has not widely adopted by

vegetation ecologists in the United States, but is receiving greater attention as of late because of availability of computer technology and because of the inherent ecological utility of such classifications. Associations are the basic units of vegetation in this classification scheme, and are closely related to microscale site factors which correlate highly with productivity (cf. MacClean and Bolsinger 1973). For example. many of the more mesic understory species groups seen in Table 3 (eg. Adenocaulon bicolor, Disporum hookeri trachycarpum, Osmorhiza chilensis et cetera) contribute positively to Dunning's Site Index, while xeric species (eg. Arctostaphylos patula) decrease in relation to the latter index. The utility of vegetation classification by this method to forestry and silviculture is obvious, but has not been undertaken in R5 in a systematic ecologically oriented manner as has been done in such an exemplary manner in R4 and R6. The Habitat-Type classification now being developed in these latter Regions by former students of R. Daubenmire is roughly equivalent to the Alliance concept employed herein.

A. Alnus rhombifolia-Peltiphyllum peltatum Alliance (SAF 221)

This vegetation is the riparian forest type along the larger watercourses in mountainous areas of California. Alnus rhombifolia, Peltiphyllum peltatum and Carex nudata form a distinct, repetitive unit which occurs in the flood plain of mountain rivers. This vegetation type contains A. rhombifolia, P. peltatum, Aralia californica and C. nudata along the South Fork of the American River at 825 (2700 ft) meters elevation on the proposed Peavine Research Natural Area for

example (Taylor and Randall 1976). Knapp (1965) distinguishes a related vegetation type with A. rhombifolia, but containing Calycanthus occidentalis, Urtica holoserica et cetera (Knapp p. 184).

1. Alnus rhombifolia-Cornus sessilis Association.

The lower reaches of the minor order tributary streams of the Trinity River in the study area are typified by the A. rhombifolia-C. sessilis association. The A. rhombifolia-P. peltatum Alliance diagnostic taxa are present, in addition to the major codominant Cornus sessilis in the small tree stratum. Cornus sessilis is absent from most of the riparian vegetation along the major streams, such as the main Trinity River, due to more frequent flooding. Alnus rhombifolia, Fraxinus latifolia, Cornus sessilis and Acer macrophyllum are major tree-stratum components, with Pseudotsuga menziesii, Quercus chrysolepis and Taxus brevifolia occurring on occasion. A moderately rich shrub layer is typical, often with Acer circinatum, Corylus cornuta californica, Symphoricarpos mollis, Crataegus douglasii, Rhamnus purshiana, Philadelphus lewisii gordonianus and Ribes roezlii. Lianas such as Lonicera hispidula, Rubus leucodermis, the introduced R. procerus, and Vitis californica are conspicuous. The herbaceous union is poor considering the mesic situation, and is dominated by coarse herbs with large rhizomes which can not tolerate regular floods (eg. Aralia). This association is found in the study area along the main channel of Manzanita Creek, and on minor tributary drainages thereof which maintain summer flows, and is found below about 1200 m (4000 ft) elevation.

Table 5A gives the forest statistics for the Alnus rhombifolia-Cornus sessilis plots sampled. Alnus dominates the tree stratum, averaging 159 stems/ha and 27.3 m^2/ha Basal Area. Pseudotsuga menziesii and Acer macrophyllum are important codominants. Fire is relatively unimportant in structuring this vegetation.

2. Alnus rhombifolia-Cornus stolonifera Association

This association is the higher elevation equivalent of the A. rhombifolia-Cornus sessilis association, occuring generally above 1200 m (4000 feet) altitude. Cornus stolonifera, Rhododendron occidentale and Salix commutata dominate the vegetation, and form a dense tall shrub layer under the emergent Alnus with Corylus cornuta californica. Shrubs from the A. rhombifolia-C. sessilis association are generally absent. Carex amplifolia and Torreyochloa pauciflora are graminoids which dominate the herb layer. This association is not limited to the stream margins, but can occur where there is free water at the surface throughout the summer, as at Mosquito Hollow near the Manzanita Creek drainage.

B. Pinus sabiniana Alliance

This vegetation is that which has been masquerading with other physiognomically similar alliances as "Foothill Woodland" vegetation (see Griffin 1977 for a review of the recent literature). Pinus sabiniana is a conspicuous diagnostic species, along with a suite of associated taxa. Being that this vegetation was not well represented in the Manzanita Creek drainage, and since it has not been phytosociologically characterized in California, no comprehensive discussion of this alliance will be offered here.

3. Pinus sabiniana-Cercis occidentalis Association.

Pinus sabiniana is the dominant tree species in the Pinus sabiniana-Cercis occidentalis association, with an average density of 119 stems/ha and 21.5 m^2/ha Basal Area. Quercus chrysolepis and Q. garryana are common tree associates. Ceanothus cuneatus, Cercis occidentalis and Toxicodendron diversilobum are the dominants of the dense shrub layer. Annual herbs form a dense third synusium in this association, but due to the late date of this survey, their floristic contribution to this vegetation is underestimated. This vegetation is most abundant on the lower, warmer (south or east facing), steep, rocky slopes in the Manzanita Creek drainage, but does extend to nearly 1150 m (3800 feet) in harsher microsites. There is some indication that this association is seral to the Pseudotsuga menziesii alliance following fire (Table 3, Releve MNZP 25)

4. Ceanothus cuneatus Association.

On very rocky, hot slopes at lower elevations in the study area, Ceanothus cuneatus chaparral occurs. Only one stand of this vegetation was sampled in the Manzanita Creek drainage (MNZ 5, Table 3), and there are only a few small patches of this vegetation identifiable on aerial photography. Ceanothus cuneatus is the dominant shrub. Other shrub species are few, and trees are generally absent. The herbaceous layer is dense, but likewise was undersampled because of the late season of our visit.

C. Pseudotsuga menziesii Alliance

This vegetation is the zonally dominant habitat type in the vicinity of the study area, occuring on semi-xeric to mesic slopes below ca. 1200 m (4000 ft) altitude. Pseudotsuga is the dominant or codominant tree

in two of the three associations in this alliance found in the Manzanita Creek drainage. Quercus chrysolepis is an important codominant. Studies on this alliance to the north (Mize, 1973) and southwest (Taylor 1975) have been conducted. Mize recognized 4 major Pseudotsuga communities. 1) Pseudotsuga-Taxus brevifolia in mesic ravines, with Acer macrophyllum, Gaultheria shallon, Berberis nervosa, Acer circinatum, Corylus cornuta, Vancouveria planipetala and Achlys triphylla. Most of these taxa are absent from the Manzanita Creek drainage (cf. Species List). 2) Pseudotsuga menziesii-Achlys triphylla, with Pinus ponderosa, P. lambertiana, Whipplea modesta, Adenocaulon bicolor, Pyrola picta, Goodyeria oblongifolia, Disporum hookeri trachycarpum and Vancouveria planipetala. Again, many of these taxa are not found in the Manzanita Creek drainage, so that this association type differs substantially. 3) Pseudotsuga-Pinus lambertiana, with Lithocarpus densiflora. Again, this vegetation differs considerably from the Manzanita Creek Pseudotsuga forests, as Lithocarpus is absent. 4) Quercus chrysolepis-Pseudotsuga, with Arbutus menziesii. This vegetation type of Mize's is probably synonymous with the Pseudotsuga-Q. chrysolepis Association named here. Taylor (1975) inventoried the Pseudotsuga forests at the base of South Fork Mountain in the South Fork of the Trinity River canyon. The Pseudotsuga vegetation at this site is seemingly more mesic, with Berberis nervosa and Chrysolepis chrysophylla being important species in that vegetation.

5. Quercus garryana Association.

This association is related to the Pseudotsuga menziesii Alliance both floristically and successionally. Some stands of this vegetation contain a number of Pseudotsuga Alliance characteristic taxa, and can be seen to be early seral stages of succession to Pseudotsuga-Q. chrysolepis vegetation

following fire. Other stands on very steep, rocky but mesic sites appear to be non-seral, at least within the fire-frequency regimen typical of these ecosystems. A typical stand of this vegetation has a dense stand of Q. garryana forming a complete canopy. The shrub layer is absent or sparse. The herbaceous layer is dominated by a dense stand of the perennial bunchgrass Bromus marginatus. Table 5C summarizes the stand data from the single plot sampled in this vegetation.

6. Pseudotsuga menziesii-Quercus chrysolepis Association. This association is zonally the most common in the Manzanita Creek drainage at lower elevations. A typical stand has a two-layered tree canopy, with emergent Pseudotsuga over a nearly complete subcanopy of Q. chrysolepis. Acer macrophyllum and Arbutus menziesii are important codominants. Pseudotsuga averages 20.4 m^2/ha Basal Area, and 254 stems/ha. Quercus chrysolepis averages 9.2 m^2/ha Basal Area and 593 stems/ha. Table 5D summarizes the plot data from the three stands sampled in this type.

7. Pinus ponderosa-Quercus kelloggii Association

This association is both floristically and physiognomically distinct as a kind of vegetation in the Manzanita Creek drainage. Although zonally limited in extent, it is a quite repeatable unit. Open, park-like stands of Pinus ponderosa and P. lambertiana are typical of this association, with large scattered Q. kelloggii. Dense reproduction of Pseudotsuga is often seen invading where recent fires have been excluded, and this association is undoubtably seral to the Pseudotsuga-Q. chrysolepis association if frequent, light ground fires are absent. Following catastrophic fire, Ceanothus integerrimus is the pioneer brush species establishing on sites which support this habitat type. Stands with various apparent stages of successional change evident were observed in the Manzanita Creek drainage, indicating

that the P. ponderosa-Q. kelloggii association is a transient and patchy but naturally permanent component of these forests.

Table 5E gives the summarized data from the 4 plots sampled in this type. Pinus ponderosa averages 62.5 m^2/ha Basal Area, and Pseudotusga averages 34.8 m^2/ha with P. lambertiana at 18.7 m^2/ha. Densities for these dominants respectively average 190, 55 and 310 stems/ha.

D. Abies concolor Alliance

Abies concolor is a common dominant or codominant species of the upper elevation (above 1200 m, 4000 ft) forests of the North Coast Ranges. These forests have been inventoried by Sawyer and Thornburgh (summarized in Sawyer and Thornburgh 1977) in a series of unpublished PSW reports (Sawyer and Thornburgh 1969, 1970, 1971, 1974). Again, the forests of the Manzanita Creek drainage, being further to the south of the central development of the more diverse coniferous forests of the North Coast Ranges, differ considerably from those described by Sawyer and Thornburgh.

Six associations in the Abies concolor Alliance are recognized from the Manzanita Creek drainage. Abies concolor is dominant in three of these vegetation types, and codominant in another. Pseudotsuga is dominant in one of these associations, and codominant in another.

8. Pseudotsuga menziesii-Cornus nuttallii Association.

This association occurs on the most mesic, warm sites where Pseudotsuga-dominated vegetation is found in this region. At higher elevations, water evapotranspiration stress is less, Pseudotsuga is excluded by the more cold adapted Abies concolor. A typical stand of this vegetation has a dense, closed canopy of Pseudotsuga averaging 67 m^2/ha Basal Area and 106 stems/ha. Abies concolor is a codominant of the

overstory, averaging 19.6 m^2/ha Basal Area and 403 stems/ha(Table 5F). Cornus nuttallii forms a second tree canopy often with Acer macrophyllum, both occurring here in a non-riparian situation. The shrub layer in this vegetation is well developed and diverse (Table 3), as is the herb layer, where a number of mesophytic taxa are found.

9. Abies concolor-Pseudotusga menziesii Association

This association is a relatively minor component of the forest vegetation in the Manzanita Creek drainage. It is transitional from the lower elevation Pseudotsuga dominated forests to the higher elevation Abies concolor dominated forests, as can be seen from the number of species of these two Alliances in this Association. Abies concolor averaged 50 m^2/ha Basal Area on the two stands sampled, and Pseudotsuga 3.3 m^2/ha (Table 5G).

10. Abies concolor-Acer glabrum Association.

A typical stand of this regionally important montane vegetation type has a dense overstory canopy dominated by Abies concolor at 90 m^2/ha Basal Area. Acer glabrum forms a second dense tree story along with scattered Sorbus scopulina. A rich mesic large shrub layer is present, consisting of Sambucus melanocarpa, Ribes nevadense et cetera (Table 3). The herb layer is diverse, and has a number of mesophytic tall herbs such as Castilleja miniata, Actea rubra arguta, Agastache urticifolia, Chamaenerion angustifolium et cetera (Table 3). This vegetation type is the regional climax forest type on cool, mesic sites at montane elevations (1200-2000+? m elevation) in the study area. Following fire on these kinds of sites, Quercus vaccinifolia and/or Pinus attenuata establish. Taxa typical of the Salix jepsonii-Paxistima myrsinites assocation are also involved in this chronosequence. Succession leads to stands like the Abies-Pseudotusga association or the Abies concolor association,

followed by establishment of the Abies-Acer type.

11. Abies concolor Association

This association is apparently seral after catastrophic fire in the Abies-Acer glabrum habitat type. A typical stand consists of dense Abies which are nearly even-aged over dead or decadent Quercus vaccinifolia. Understory cover is sparse or absent. Table 3 gives the floristic composition of the single stand sampled in this type. Table 5I gives the tree importance statistics for this vegetation.

12. Pinus attenuata-Quercus vaccinifolia Association

This association developed on the mid-elevation steep slopes or ridges of the vicinity of the study area following recent crown fire. It is seral to the Abies concolor dominated forest types. Pinus attenuata forms a dense even-aged canopy in a typical stand of this association, averaging 34 m^2/ha Basal Area and 594 stems/ha. Quercus vaccinifolia forms a dense shrub understory. Herbaceous associates are few, but Pedicularis densiflora and Apocynum pumilum are constants.

Pinus attenuata also occurs at lower elevations in the Trinity River canyon nearby the Manzanita Creek drainage, where it is associated with typical chaparral vegetation on more xeric sites as it normally does elsewhere in its range (Vogl 1973).

13. Salix jepsonii-Paxistima myrsinites Association.

This vegetation is a distinctive unit in the upper reaches of the Manzanita Creek basin, generally being found above 1200 m (4000 ft) elevation. It occurs in gullies and sheltered coves at the base of northerly facing slopes, adjacent to montane chaparral. The environmental position of the association suggests that it is partly seral, being maintained by frequent fire, although there is some evidence (eg. rocky, shallow soils) that it may be a quasi-static unit in the regional vegetation mosaic.

A typical stand of this association has widely scattered Abies concolor individuals in the overstory, as well as a quite distinctive species rich mesic tall-shrub canopy of Salix jepsonii, Euonymus occidentalis, Rhamnus purshianus, Acer glabrum, Amelanchier pallida and Ribes nevadense. Paxistima myrsinites is a conspicuous low shrub component. Herbaceous taxa usually line the gully sides of this association, and Eupatorium occidentale grows in the seasonally dry gully bottom.

E. Quercus vaccinifolia Alliance

14. Cercocarpus betuloides macrourus Association

This vegetation occurs on the steepest slopes in the headwaters of the drainage of Manzanita Creek. On very rocky sites, it seems to be climax, but is seral following major fires on deeper soils, and succeeds to Abies concolor dominated forests. Quercus vaccinifolia is a dominant, along with Garrya fremontii, Arctostaphylos patula, Prunus emarginata, Ceanothus integerrimus and C. velutinus. The non-seral ridgetop phase of this vegetation, herein termed the Cercocarpus betuloides macrourus

Association, is dominated by the latter taxon as well as Quercus vaccinifolia and Q. garryana breweri.

F. Holodiscus microphyllus-Penstemon corymbosus Alliance

This Alliance occurs on the highest rock outcrops in the Manzanita Creek basin. It is also the regional rock outcrop Alliance at lower elevations, as along the Trinity River near Big Bar. We observed three distinct associations in different types of cliff habitats in the Manzanita Creek basin.

15. Holodiscus microphyllus-Eriogonum compositum Association

This vegetation is found on the flat or rolling summits of major rock outcrops at the head of Manzanita Creek, and on nearby ridges, where soil development is absent. The vegetation is sparse, with large Holodiscus shrubs being widely scattered, along with large clumps of E. compositum.

16. H. microphyllus-Silene grayi Association

This vegetation occurs on the highest summit of Twin Sisters Mountain, above about 1750 m elevation. Silene grayi, Lunia hypoleuca and Galium grayanum are diagnostic species, indicating the shallow rocky soils which are probably quite xeric owing to the highly wind-exposed location.

17. H. microphyllus-Lewisia cotyledon heckneri Association

This vegetation occurs on a third kind of rocky site, namely on near vertical cliff faces. Selaginella wallacei, Pellaea brachyptera and Lewisia cotyledon heckneri occur in the small crevices and ledges on these rock faces.

Forest Cover Types. The forest vegetation within the Manzanita Creek drainage seems to best typify the following SAF Forest Cover Types (Soc. American Foresters 1954):

SAF 211 White Fir

SAF 221 Red Alder (White Alder variant)

SAF 233 Oregon White Oak

SAF 243 Ponderosa Pine-Sugarpine, Fir

SAF 245 Ponderosa Pine-Black Oak

SAF 248 Knobcone Pine

SAF 249 Canyon Live Oak

SAF 229 Pacific Douglas Fir

CONCLUSIONS AND RECOMMENDATIONS

The Manzanita Creek drainage supports a diverse assembledge of forest vegetation interdigitating with related brush, riparian and rocky-site types. The general positioning of these communities is depicted in Figure 1, plotting the major associations in a topographic-moisture gradient scheme. The forests are mostly young and vigorously growing stands, with some old-growth present in scattered mosaic patches. Evidence of recent fire is present most everywhere in the Manzanita Creek basin. From 1927-1936, there were 11 Class A or B fires in the drainage of Manzanita Creek (records from the Big Bar Ranger District fire atlas), but only 1 fire of these classes was recorded from 1917-1926. A wide variety of conifer age-classes are represented in the Manzanita Creek area owing to the frequency of past fire.

The area is a good proposal for Research Natural Area status because of its large size and great vegetation diversity. The area encompasses

an entire intact watershed. The watershed has a gauging station, which would be invaluable for watershed level studies of transfer processes in this kind of ecosystem. Access to the interior of the basin is limited, but improving the old trail up the creek bottom would not require much work. The entire area is relatively undisturbed by the direct works of man. The boundaries as proposed are most logical. The proposed name for the area is "Trelorita", a corruption from two nearby geographic features. Perhaps Manzanita Creek would be a better choice in light of the fact that it appears on most regional maps.

Literature Cited

Axelrod, D. I. 1976. History of the Coniferous Forests, California and Nevada. Univ. California Pubs. Botany. 70:1-62.

California Division of Mines and Geology. 1962. Redding sheet. Compiled by Rudolph G. Strand.

Ceska, A., and H. Roemer. 1971. A computer program for identifying species-releve groups in vegetation studies. Vegetatio 23:255-277.

Colwell, W. L., Jr. 1977. The status of vegetation mapping in California. Chapter 6 in M. G. Barbour and J. Major (Eds.) Terrestrial Vegetation of California, Wiley, Interscience, New York.

Cox, D. P. 1956. Geology of the Helena quadrangle, Trinity County California. Ph.D. Dissertation, Stanford University.

Ferlatte, W.J. 1974. A Flora of the Trinity Alps of Northern California. Univ. Calif. Press, Berkeley.

_____. 1979. Vascular plants found to occur in the Trinity Alps since "A Flora of the Trinity Alps of Northern California" was published in 1974. Unpublished mimeo.

Gowans, D., et. al. 1967. Soil survey of Tehama County, California. U.S.D.A., Soil Conservation Service.

Griffin, J. L. 1977. Oak woodlands. Chapter 11 in M.G. Barbour and J. Major (Eds.) Terrestrial Vegetation of California. Wiley, Interscience, New York. pp. 383-416

Knapp, R. 1965. Die vegetation von Nord- und Mittleamerika und der Hawaii-Inslen. Fischer, Stuttgart.

MacClean, C. D., and C. L. Bolsinger. 1973. Estimating Dunnings Site Index from plant indicators. U.S.D.A., Forest Service Res. Note. PNW-197.

Major, J. 1977. California climate in relation to vegetation. Chapter 2 in M. G. Barbour and J. Major (Eds.) Terrestrial Vegetation of California. Wiley, Interscience, New York. pp. 11-74.

Mallory, J. I., E. B. Alexander, W. L. Colwell, Jr., and W. R. Powell. 1969. Soils and Vegetation of the Chanchelulla Peak quadrangle, Shasta and Trinity Counties, California. State Cooperative Soil-Vegetation Survey.

_____, W. L. Colwell, and W. R. Powell. 1973. Soils and vegetation of the French Gulch quadrangle, Trinity and Shasta Counties, California. U.S.D.A. Forest Service Res. Bull. PSW-12.

Mueller-Dombois, D., and H. Ellenburg. 1974. Aims and methods of vegetation ecology. Wiley, Interscience, New York.

Muth, G. J. 1978. Klamath Mountains Flora. Unpublished checklist, Pacific Union College, Angwin, California.

Munz, P. A. 1959. A California Flora. Univ. California Press, Berkeley.

_____. 1968. Supplement to A California Flora. Univ. California Press, Berkeley.

_____. 1974. A flora of Southern California. Univ. California Press, Berkeley.

Raven, P. A., and D. I. Axelrod. 1978. Origin and relationships of the California Flora. Univ. California Pubs. Bot. 72:1-134

Rockey, R.E., K. E. Bradshaw and A. G. Sherrell. 1966. Interim report, soil vegetation survey, Orleans Ranger District, Six Rivers National Forest. Unpubl. Report.

Sawyer, J. O., and D. A. Thornburgh. 1969. Ecological reconnaissance of relic conifers in the Klamath Region. Unpublished PSW report.

_____, _____. 1970. Ecological studies in the Russian Peak area, Salmon Mountains, California. Unpublished report to Klamath National Forest.

_____, _____. 1971. Vegetation types on granodiorite in the Klamath Mountains, California, Unpublished PSW report.

_____,_____. 1974. Subalpine and montane forests on granodiorite in the central Klamath mountains of California. Ibid.

_____,_____. 1977. Montane and Subalpine vegetation of the Klamath Mountains. Ch. 20 in M. G. Barbour and J. Major (Eds) Terrestrial Vegetation of California. Wiley, Interscience, New York.

_____,_____, and J. R. Griffin. 1977. Mixed Evergreen forests. Ch. 10 in Ibid.

Taylor, D. W. 1975. Structure of an old-growth Douglas Fir Forest in northwesern California. Unpublished PSW report.

_____. 1976. Ecology of the timberline vegetation at Carson Pass, Alpine County, California. Ph.D. Dissertation, Univ. California, Davis.

_____, and D. C. Randall. 1976. Ecological survey of the vegetation of the proposed Peavine Research Natural Area, El Dorado National Forest, California. Unpublished PSW report.

U. S. Department of Commerce. 1953-1978. Annual Climatic Summaries. Washington, D. C.

Vogl, R. J. 1973. Ecology of knobcone pine in the Santa Ana Mountains, California. Ecol. Monogr. 43:125-143.

Waring, R. H., and J. Major. 1964. Some vegetation of the California coastal redwood region in relation to gradients of moisture, nutrients, light and temperature. Ecol. Monogr. 34:167-215.

Whittaker, R. H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecol. Monogr. 30:279-338.

Plant species list for the Manzanita Creek watershed, Trinity County, California. The number to the right of each taxon is the page number where the taxon can be referenced in Munz and Keck's A California Flora, Munz's Supplement to A California Flora (indicated by S), and Munz's A Flora of Southern California (indicated by FSC). The taxa that are not included in Ferlatte's A Flora of the Trinity Alps of Northern California or Ferlatte's list of "Vascular plants found to occur in the Trinity Alps since A Flora of the Trinity Alps of Northern California was published in 1974" are indicated by O.

ACERACEAE

O Acer circinatum Pursh 996
Riparian. Uncommon. Seen only near Big Bar.

Acer glabrum Torr. var. torreyi (Greene) Smiley 995
Riparian; seeps in mixed conifer forest. Frequent at higher elevations.

Acer macrophyllum Pursh 996
Riparian; seeps in mixed conifer forest. Common.

ADIANTACEAE

O Adiantum jordanii K. Mull. 38
Brushy slopes, lower elevations. Uncommon.

Adiantum pedatum L. var. aleuticum Rupr. 38
Riparian. Infrequent.

AMARYLLIDACEAE

O Dichelostemma ida-maia (Wood) Greene 1386
Mixed conifer forest. Rare.

O Dichelostemma volubilis (Moriere) Heller 1386
Brushy slopes, lower elevations. Frequent.

O Triteleia laxa Benth. 1381
Brushy slopes, lower elevations. Infrequent.

ANACARDIACEAE

O Rhus trilobata Nutt. ex T. & G. var. quinata Jeps. 998
Brushy slopes, lower elevation. Infrequent.

O Toxicodendron diversilobum (T. & G.) Greene 998, 67FSC
Riparian; brushy slopes, lower elevations. Frequent.

APOCYNACEAE

Apocynum pumilum (Gray) Greene 451
Mixed conifer forest. Frequent.

O Cycladenia humilis Benth. 450
Open rocky ridgetops, talus slopes, higher elevations. Uncommon.

O Vinca major L. 450
Riparian. Introduced. Seen only at Big Bar.

ARALIACEAE

o Aralia californica Wats. 1000
Riparian. Common along creek.

ARISTOLOCHIACEAE

Asarum caudatum Lindl. 965
Seeps in mixed conifer forest. Common.
Asarum hartwegii Wats. 965
Seeps in mixed conifer forest. Common.

ASPIDIACEAE

o Dryopteris arguta (Kaulf.) Watt. 42
Seeps in mixed conifer forest. Uncommon.
o Polystichum munitum (Kaulf.) Presl. 40
var. imbricans (D.C. Eat.) Maxon
Montane chaparral; mixed conifer forest. Common.

BERBERIDACEAE

Berberis nervosa Pursh 109
Mixed conifer forest. Infrequent.

BETULACEAE

o Alnus rhombifolia Nutt. 900
Riparian; seeps in mixed conifer forest. Common.
Corylus cornuta Marsh. var. californica (A. DC.) Sharp. 899
Riparian. Common.

BLECHNACEAE

o Woodwardia fimbriata Sm. in Rees 44
Seeps in mixed conifer forest. Uncommon.

CAMPANULACEAE

Campanula prenanthoides Durand. 1063
Mixed conifer forest. Infrequent.

CAPRIFOLIACEAE

o Lonicera ciliosa (Pursh) Poir. 1051
Riparian. Frequent.
o Lonicera hispidula Dougl. var. vacillans Gray 1051
Riparian. Common.
Sambucus melanocarpa Gray 1047
Mixed conifer forest. Frequent.
o Symphoricarpos acutus (Gray) Dieck. 1049
Mixed conifer forest. Infrequent.
Symphoricarpos mollis Nutt. in T. & G. 1049
Riparian; brushy slopes; mixed conifer forest.
Frequent.

CARYOPHYLLACEAE

Arenaria congesta Nutt. ex T. & G. 281
Open rocky ridgetops, higher elevations. Rare.

Arenaria nuttallii Pax ssp. gregaria (Heller) Maguire 280
Open rocky ridgetops, higher elevations. Common.

Silene campanulata Wats. ssp. greenei (Wats) Hitchc. & Maguire 289
Open rocky ridgetops, higher elevations. Frequent.

Silene grayi Wats. 290
Open rocky ridgetops, higher elevations. Uncommon.

CELASTRACEAE

o Euonymus occidentalis Nutt. ex Torr. 967
Mixed conifer forest. Infrequent.

Paxistima myrsinites (Pursh) Raf. 967
Seeps in mixed conifer forest. Uncommon.

CHENOPODIACEAE

o Chenopodium botrys L. 370
Roadside, disturbed site. Introduced. Uncommon.

COMPOSITAE

Achillea lanulosa Nutt. 1228
Open grassy woodlands, lower elevations. Frequent.

Adenocaulon bicolor Hook 1239
Mixed conifer forest. Common.

o Ambrosia psilostachya DC. 1103
Roadside, disturbed site. Introduced. Frequent.

Arnica discoides Benth. 1243
Mixed conifer forest. Uncommon.

Artemisia douglasiana Bess. in Hook 1237
Disturbed roadsides; brushy slopes, lower elevations. Frequent.

o Brickellia californica (T. & G.) Gray 1270
Disturbed roadsides; brushy slopes, lower elevations. Frequent.

Brickellia greenei Gray 1270
Open rocky ridgetops, higher elevations. Rare.

o Calycadenia sp. 1125
Open grassy woodlands, lower elevations. Common.

o Carduus nutans L. var. leiophyllus (Petrovic) Arenes 1281
Disturbed roadside. Introduced. Rare.

o Centaurea solstitialis L. 1283
Disturbed roadsides. Introduced. Common.

Chaenactis douglasii (Hook.) H. & A. 1154
Open rocky ridgetops, higher elevations. Uncommon

o Chrysothamnus parryi (Gray) Greene ssp. latior Hall & Clem. 1189
Open rocky ridgetops, higher elevations. Frequent.

COMPOSITAE

o Cichorium intybus L. 1288
Disturbed roadside. Introduced. Infrequent.

o Cirsium arvense (L.) Scop. 1280
Seeps in mixed conifer forest. Introduced. Infrequent.

o Conyza canadensis (L.) Cronq. var. glabrata (Gray) Cronq. 1224
Disturbed roadsides. Frequent.

Crepis acuminata Nutt. 1309
Open rocky ridgetops, higher elevation. Infrequent.

Eriophyllum lanatum (Pursh) Forbes var. lanceolatum (Howell) Jeps. 1146
Open rocky ridgetops, higher elevations. Infrequent.

Eupatorium occidentale Hook 1268
Mixed conifer forest. Frequent.
Open rocky ridgetops, higher elevations. Common.

o Helianthella californica Gray var. nevadensis (Greene) Jeps. 1090
Open grassy woodlands, lower elevations. Uncommon.

Hieracium albiflorum Hook 1305
Mixed conifer forest. Common.

o Hieracium greenei Gray 1305
Riparian; brushy slopes,lower elevations. Frequent.

o Lactuca serriola L. var. integrata Gren. & Godr. 1304
Disturbed roadsides. Introduced.

o Lessingia nemaclada Greene 1222
Disturbed roadsides; brushy slopes; open grassy woodlands, lower elevations. Common.

o Lunia hypoleuca Benth. 1254
Open rocky ridgetops, higher elevations.

Madia sp. 1113
Open grassy woodlands, lower elevations. Common.

Solidago canadensis L. ssp. elongata (Nutt.) Keck 1185
Open rocky ridgetops on serpentine. Uncommon.

o Stephanomeria virgata Benth. 1295
Mixed conifer forest. Frequent.

Taraxacum officinale Wiggers 1310
Seeps in mixed conifer forest. Common.

o Wyethia helenioides (DC.) Nutt. 1084
Brushy slopes, lower elevations. Uncommon.

CORNACEAE

Cornus nuttallii Aud. 1035
Moist mixed conifer forest. Common.

o Cornus sessilis Torr. ex Durand 1035
Riparian. Common.

Cornus stolonifera Michx. 1034
Seeps in mixed conifer forest.

CRASSULACEAE

Sedum obtusatum Gray ssp. boreale Clausen 727
Open rocky ridgetops, higher elevations. Common.

CRUCIFERAE

Arabis breweri Wats. 262
Open rocky ridgetops, higher elevations. Uncommon.

o Arabis drummondii Gray 260
Mixed conifer forest. Frequent.

Arabis sp. Caespitose perennial in fruit. Common 256
Twin Sisters Mountain

o Brassica nigra (L.) Koch. 236
Disturbed roadsides. Introduced. Common.

o Erysimum capitatum (Dougl.) Greene 268
Open rocky ridgetops, higher elevations. Uncommon.

o Nasturtium officinale R. Br. 240
Seeps in mixed conifer forest.

Streptanthus tortuosus Kell. var. pallidus Jeps. 218
Open rocky ridgetops, higher elevations. Frequent.

CRYPTOGRAMMATACEAE

o Onychium densum Brack. in Wilkes 37
Mixed conifer forest. Common.

CUCURBITACEAE

o Marah fabaceus (Naud.) Greene 1059
var. agrestis (Greene) Stocking
Open grassy woodlands. Uncommon.

CUPRESSACEAE

Calocedrus decurrens (Torr.) Florin 59, 78
Montane chaparral. Scattered.

CYPERACEAE

Carex amplifolia Boott. 1456
Seeps in mixed conifer forest. Frequent.

o Carex bolanderi Olney 1443
Riparian; seeps in mixed conifer forest. Frequent.

Carex brevipes W. Boott. 1450
Seeps in mixed conifer forest. Frequent.

o Carex senta Boott. 1460
Riparian. Common.

o Carex subfusca W. Boott. 1445
Seeps in mixed conifer forest. Frequent.

o Cyperus niger R. & P. var. rivularis (Kunth.) V. Grant 1424
Riparian. Uncommon.

DENNSTAEDTIACEAE

Pteridium aquilinum (L.) Kuhn var. pubescens Underw. 32
Mixed conifer forest. Common.

EQUISETACEAE

Equisetum arvense L. 28
Riparian. Uncommon.
Equisetum laevigatum A. Br. 27
Seeps in mixed conifer forest. Frequent.

ERICACEAE

o Arbutus menziesii Pursh. 415
Mixed hardwood-evergreen forest. Common.
o Arctostaphylos manzanita Parry 422
Montane chaparral; brushy slopes, lower elevations. Frequent.
Arctostaphylos patula Greene 423
Montane chaparral. Frequent.
Rhododendron occidentale (T. & G.) Gray 412
Seeps in mixed conifer forest. Frequent.

EUPHORBIACEAE

o Euphorbia peplus L. 168
Disturbed roadsides. Introduced. Uncommon.

FAGACEAE

Quercus chrysolepis Liebm. 906
Common throughout area.
o Quercus chrysolepis Liebm. var. nana (Jeps.) Jeps. 906
Brushy slopes; mixed hardwood-evergreen forest. Common. Mixed conifer forest. Frequent.
o Quercus garryana Dougl. 904
Montane chaparral; open grassy woodlands. Common.
Quercus garryana Dougl. var. breweri (Engelm. in Wats.) Jeps. 904
Montane chaparral; brushy slopes, lower elevations. Common.
Quercus kelloggii Newb. 903
Riparian. Common.
Quercus vaccinifolia Kell. 907
Montane chaparral. Common.

GARRYACEAE

Garrya fremontii Torr. 1036
Open grassy woodlands, lower elevations. Common.

GENTIANACEAE

Frasera albicaulis (Griseb. in Hook.) Kuntze 445
ssp. nitida (Benth.) Post
Open rocky ridgetops on serpentine, higher elevations. Rare.

GERANIACEAE

O Geranium sp. 140
Open grassy woodlands, lower elevations. Uncommon.

GRAMINEAE

O Agrostis semiverticillata (Forsk.) C. C r. 1520
Seeps in mixed conifer forest. Uncommon.

O Aira caryophyllea L. 1514
Disturbed roadsides; brushy slopes, lower elevations. Introduced. Frequent.

O Avena fatua L. 1514
Disturbed roadsides. Introduced. Common.

O Bromus diandrus Roth 1473, 187S
Open grassy woodlands, lower elevations. Introduced. Common.

Bromus marginatus Nees. 1470
Open grassy woodlands, lower elevations. Common.

O Bromus mollis L. 1473
Open grassy woodlands, lower elevations. Introduced. Uncommon.

O Bromus rubens L. 1474
Open grassy woodlands, lower elevations. Introduced. Uncommon.

O Bromus tectorum L. 1474
Open grassy woodlands, lower elevations. Open rocky ridgetops, higher elevations. Introduced. Common.

Bromus sp. 1468
Open grassy woodlands. Common.

O Cinna latifolia (Trev.) Griseb. 1522
Brushy slopes, lower elevations. Rare.

O Cynosurus echinatus L. 1495
Disturbed roadsides. Introduced. Frequent.

Elymus glaucus Buckl. 1505
Riparian. Common.

O Elymus triticoides Buckl. 1505
Disturbed roadsides. Rare.

O Gastridium ventricosum (Gouan) Schinz. & Thell. 1525
Open grassy woodlands. Introduced. Uncommon.

O Melica californica Scribn. 1498
Open grassy woodlands, lower elevations. Common.

Panicum sp. 1545
Riparian. Uncommon.

O Polypogon monspeliensis (L.) Desf. 1524
Riparian. Uncommon.

O Setaria glauca (L.) Beauv. 1548
Riparian. Introduced. Uncommon.

Sitanion hystrix (Nutt.) J.G. Sm. 1506
Open grassy woodlands; brushy slopes, lower elevations. Common.

Stipa occidentalis Thurb. 1533
Open grassy woodlands, lower elevations. Frequent.

O Torreyochloa pauciflora (Presl.) Church 1480
Seeps in mixed conifer forest. Common.

Vulpia sp. 1475
Open grassy woodlands, lower elevations. Common.

GYMNOGRAMMACEAE

o *Pityrogramma triangularis* (Kaulf.) Maxon 37
Rocky outcrops in open grassy woodlands and brushy slopes, lower elevations. Uncommon.

HYDROPHYLLACEAE

Draperia systyla (Gray) Torr. 545
Open rocky ridgetops, higher elevations. Uncommon.
Eriodictyon californicum (H. & A.) Torr. 548
Brushy slopes, lower elevations. Infrequent.
Nemophila sp. 519
Brushy slopes, lower elevations, Common.
Phacelia mutabilis Greene 534
Mixed conifer forest. Frequent.

HYPERICACEAE

Hypericum perforatum L. 192
Riparian. Introduced. Frequent.

IRIDACEAE

Iris tenuissima Dykes 1390
Mixed conifer forest. Common.

JUNCACEAE

Juncus balticus Willd. 1405
Seeps in mixed conifer forest. Frequent.

LABIATAE

Agastache urticifolia (Benth.) Kuntze 696
Seeps in mixed conifer forest. Infrequent.
Monardella odoratissima Benth. ssp. *pallida* (Heller) Epl. 713
Mixed conifer forest. Uncommon.
o *Satureja douglasii* (Benth.) Briq. 708
Mixed conifer forest. Uncommon.
o *Stachys mexicana* Benth. 698, 102S
Riparian. Common.

LEGUMINOSAE

o *Cercis occidentalis* Torr. ex Gray 799
Riparian; open grassy woodland, lower elevations. Frequent.
o *Lathyrus jepsonii* Greene ssp. *californicus* (Wats.) C.L. Hitchc. 892
Mixed conifer forest; open grassy woodlands. Frequent.

LEGUMINOSAE

Lotus crassifolius (Benth.) Greene 844
Montane chaparral. Frequent.

o Lupinus grayi (Wats.) Wats. 822
Mixed conifer forest. Rare.

Lupinus latifolius J.G. Agardh. 827
Mixed conifer forest. Uncommon.

o Melilotus albus Desr. 832
Disturbed roadsides. Introduced. Common.

Trifolium sp. (annual w/ involucre) Infreq. 832
Lower grassy openings.

LILIACEAE

Clintonia uniflora (Schult.) Kunth 1333
Seeps in mixed conifer forest. Infrequent.

Disporum hookeri (Torr.) Nichols 1332
var. trachyandrum (Torr.) Q. Jones
Mixed conifer forest. Common.

Erythronium grandiflorum Pursh var. pallidum St. John 1337
Seeps in mixed conifer forest. Uncommon.

Fritillaria cf purdyi Eastw. Uncommon 1340
Scree slope, Twin Sisters Mts.

o Lilium pardalinum Kell. 1344
Seeps in mixed conifer forest. Frequent.

Lilium washingtonianum Kell. 1342
Montane chaparral. Frequent.

Smilacina racemosa (L.) Desf. 1331
Riparian; Mixed conifer forest; mixed hardwood-evergreen forest. Common.

o Trillium chloropetalum (Torr.) Howell 1355
Seeps in mixed conifer forest. Rare.

LORANTHACEAE

o Phoradendron flavescens (Pursh) Nutt. 991
var. villosum (Nutt.) Engelm.
Frequent in Quercus spp.

OLEACEAE

o Fraxinus latifolia Benth. 447
Riparian. Frequent.

ONAGRACEAE

Chamerion angustifolium (L.) Holub. 928
Mixed conifer forest. Infrequent.

Clarkia sp. 934
Brushy slopes, lower elevations. Common.

Epilobium adenocaulon Hausskn. var. parishii (Trel.) Munz 932
Riparian. Frequent.

ONAGRACEAE

Epilobium paniculatum Nutt. ex T. & G. 929
Riparian; brushy slopes, lower elevations. Frequent.
Gayophytum diffusum T. & G. ssp. 133S
ssp. parviflorum Lewis & Szweykowski
Open rocky ridgetops, higher elevations.
Mixed conifer forest. Common
o Zauschneria californica Presl. ssp. latifolia (Hook) Keck 926
Open rocky ridgetops, higher elevations. Frequent.

ORCHIDACEAE

Corallorhiza maculata Raf. 1400
Mixed conifer forest. Infrequent.
Habenaria dilatata (Pursh) Hook 1396
var. leucostachys (Lindl.) Ames
Seeps in mixed conifer forest. Frequent.
Listera convallarioides (Sw.) Torr. 1398
Seeps in mixed conifer forest. Frequent.

PINACEAE

Abies concolor (Gord. & Glend.) Lindl. 49
Mixed conifer forest; mixed hardwood-evergreen forest. Common.
o Pinus attenuata Lemmon 54
Montane chaparral. Frequent.
Pinus lambertiana Dougl. 52
Mixed conifer forest. Frequent.
Pinus ponderosa Dougl. ex P. & C. Lawson 53
Mixed conifer forest. Frequent.
o Pinus sabiniana Dougl. 55
Open grassy woodlands, lower elevations. Common.
Pseudotsuga menziesii (Mirb.) Franco 57
Mixed conifer forest; mixed hardwood-evergreen forest. Common.

PLANTAGINACEAE

Plantago lanceolata L. 408
Disturbed roadsides. Introduced. Infrequent.
o Plantago major L. 406
Seeps in mixed conifer forests. Introduced. Common.

POLEMONIACEAE

o Leptodactylon pungens (Torr.) Rydb. 505
ssp. hookeri (Dougl.) Wherry
Mixed conifer forest. Common.

POLYGALACEAE

Polygala cornuta Kell. 156
Mixed conifer forest. Frequent.

POLYGONACEAE

Eriogonum compositum Dougl. ex Benth. 45S
Open rocky ridgetops, higher elevations. Uncommon.
Eriogonum nudum Dougl. ex Benth. var. oblongifolium Wats. 68S
Open grassy woodlands, lower elevations.
Open rocky ridgetops, higher elevations. Frequent.
Eriogonum umbellatum Torr. var. polyanthum (Benth.) Jones 336, 44S
Open rocky ridgetops, higher elevations. Frequent.
O Eriogonum vimineum Dougl. ex Benth. 345, 58S
Open grassy woodlands, lower elevations. Frequent.
O Polygonum lapathifolium L. 365
Brush slopes, lower elevations. Uncommon.
Rumex angiocarpus Murbeck 356
Brushy slopes, lower elevations. Uncommon.
O Rumex crispus L. 358
Riparian. Introduced. Frequent.

POLYPODIACEAE

O Polypodium californicum Kaulf. 45
Rocky outcrops on brushy slopes and open grassy woodlands, lower elevations. Uncommon.
O Polypodium glycyrrhiza D.C. Eat. 46
Riparian. Frequent.

PORTULACACEAE

Calyptridium umbellatum (Torr.) Greene 305
Summit of W. Twin Sisters Mountain.
Lewisia cotyledon (Wats.) Rob. in Gray 297
var. heckneri (Mort.) Munz
Open rocky ridgetops, higher elevations. Frequent.

PRIMULACEAE

Trientalis latifolia Hook 404
Mixed conifer forest. Common.

PYROLACEAE

Chimaphila menziesii (R. Br. ex D. Don) Spreng. 435
Mixed conifer forest. Frequent.
Chimaphila umbellata (L.) Barton 435
var. occidentalis (Rydb.) Blake
Mixed conifer forest. Frequent.

PYROLACEAE

Pyrola asarifolia Michx. var. purpurea (Bunge) Fern 433
Seeps in mixed conifer forest. Frequent.
Pyrola picta Sm. forma aphylla (Sm.) Camp. 434
Mixed conifer forest. Uncommon.
o Pyrola picta Sm. ssp. dentata (Sm.) Piper 434
Mixed conifer forest. Uncommon.
o Pterospora andromedea Nutt. 436
Mixed conifer forest. Infrequent.

RANUNCULACEAE

Actaea rubra (Ait.) Willd. ssp. arguta (Nutt.) Hult. 81
Mixed conifer forest; seeps in mixed conifer forest. Frequent.
Aquilegia formosa Fisch. in DC. 105
var. truncata (F. & M.) Baker
Seeps in mixed conifer forest. Common.

o Clematis ligusticifolia Nutt. in T. & G. 103
Riparian. Frequent.

RHAMNACEAE

Ceanothus cordulatus Kell. 978
Open grassy woodlands; brushy slopes, lower elevations. Common.
o Ceanothus cuneatus (Hook) Nutt. 982
Brushy slopes, lower elevations. Common.
o Ceanothus integerrimus H. & A. 977
Montane chaparral. Common.
o Rhamnus crocea Nutt. in T. & G. 971
ssp. ilicifolia (Kell.) C.B. Wolf
Brushy slopes, lower elevations. Frequent.
Rhamnus purshiana DC. 973
Riparian. Common.

ROSACEAE

Amelanchier pallida Greene 793
Mixed conifer forest. Common.
o Aruncus vulgaris Raf. 758
Riparian. Infrequent.
o Cercocarpus betuloides Nutt. ex T. & G. 782
Brushy slopes, lower elevations. Frequent.
o Cercocarpus betuloides Nutt. ex T. & G. 783
var macrourus (Rydb.) Jeps.
Montane chaparral. Common.
o Crataegus douglasii Lindl. 794
Riparian. Rare.

ROSACEAE

Holodiscus microphyllus Rydb. 759
var. glabrescens (Greenm.) Ley
Open rocky ridgetops, higher elevations. Common.

Potentilla glandulosa Lindl. 774
Riparian. Uncommon.

Prunus emarginata (Dougl.) Walp. 789
Montane chaparral. Frequent.

Rosa pisocarpa Gray 787
Mixed conifer forest; seeps in mixed conifer forest; mixed hardwood-evergreen forest. Common.

Rubus leucodermis Dougl. ex T. & G. 785
Mixed conifer forest; seeps in mixed conifer forest; mixed hardwood-evergreen forest. Frequent.

Rubus parviflorus Nutt. 785
Mixed conifer forest. Common.

o Rubus procerus P.J. Muell. 784
Riparian. Introduced. Frequent.

o Rubus ursinus Cham. & Schlecht. 784
Riparian; mixed conifer forest; seeps in mixed conifer forest. Common.

Sorbus scopulina Greene 791
Seeps in mixed conifer forest. Frequent.

RUBIACEAE

o Galium grayanum Ehrend 1045
Open rocky ridgetops, higher elevations. Uncommon.

o Galium nuttallii Gray 1042
Open grassy woodlands; brushy slopes, lower elevations. Common.

Galium triflorum Michx. 1040
Mixed conifer forest; seeps in mixed conifer forest. Common.

SALICACEAE

Salix commutata Bebb. 915
Mixed conifer forest. Infrequent.
Seeps in mixed conifer forest. Common.

o Salix hindsiana Benth. 913
Riparian. Frequent.

Salix jepsonii C.K. Schneid. 917
Mixed conifer forest; seeps in mixed conifer forest. Infrequent.

SAXIFRAGACEAE

Heuchera merriami Eastw. 742
Open rocky ridgetops, higher elevations. Uncommon.

Mitella trifida Grah. 740
Mixed conifer forest.

o Peltiphyllum peltatum (Torr.) Engl. 733
Riparian. Common.

Philadelphus lewisii Pursh ssp. californicus (Benth.) Munz 744
Riparian. Common.

Ribes nevadense Kell. var. glaucescens (Eastw.) Berger 748
Mixed conifer forest. Frequent.

Ribes roezlii Regel 753
Mixed conifer forest; seeps in mixed conifer forest. Infrequent.

o Tiarella unifoliata Hook. 739
Riparian. Common.

o Whipplea modesta Torr. 745
Mixed conifer forest. Infrequent.

SCROPHULARIACEAE

Castilleja applegatei Fern. 670
Open rocky ridgetops, higher elevations. Common.

Castilleja miniata Dougl. ex Hook. 670
Seeps in mixed conifer forest. Infrequent.

o Keckiella breviflora (Lindl.) Straw. 640, 803FSC
Riparian. Frequent.

Mimulus moschatus Dougl. ex Lindl. 610
Seeps in mixed conifer forest. Common.

Pedicularis densiflora Benth. ex Hook. 658
Mixed conifer forest. Uncommon.

o Penstemon corymbosus Benth. 641
Open rocky ridgetops, higher elevations. Common.

Penstemon deustus Dougl. ex Lindl. 632
Open rocky ridgetops, higher elevations. Frequent.

o Penstemon heterophyllus Lindl. ssp. purdyi Keck 639
Open rocky ridgetops, higher elevations. Frequent.

Penstemon newberryi Gray ssp. berryi (East$_{w}$.) Keck 640
Open rocky ridgetops, higher elevations. Uncommon.

o Synthyris reniformis (Dougl.) Benth. var. cordata Gray 657
Riparian. Infrequent.

Verbascum thapsus L. 627
Disturbed roadsides. Introduced. Uncommon.

SELAGINELLACEAE

Selaginella wallacei Hieron. 24
Open rocky ridgetops, higher elevations. Frequent.

SINOPTERIDACEAE

o Cheilanthes gracillima D.C. Eat. in Torr. 34
Open rocky ridgetops, higher elevations. Frequent.
Pellaea brachyptera (T. Moore) Baker 36
Open rocky ridgetops, higher elevations. Frequent.

TAXACEAE

Taxus brevifolia Nutt. 65
Riparian. Infrequent.

UMBELLIFERAE

Angelica arguta Nutt. ex T. & G. 1028
Open rocky ridgetops; montane chaparral. Frequent.
o Conium maculatum L. 1011
Disturbed roadsides. Introduced. Uncommon.
o Daucus pusillus Michx. 1009
Open grassy woodlands, lower elevations.
Introduced. Frequent.
Ligusticum californicum Coult. & Rose 1014
Riparian; seeps in mixed conifer forest. Common.
Lomatium macrocarpum (H. & A.) Coult. & Rose 1024
Montane chaparral; open rocky ridgetops. Frequent.
Osmorhiza chilensis H. & A. 1009
Mixed conifer forest. Common.

VERBENACEAE

o Verbena hastata L. 687
Seeps in mixed conifer forest. Infrequent.

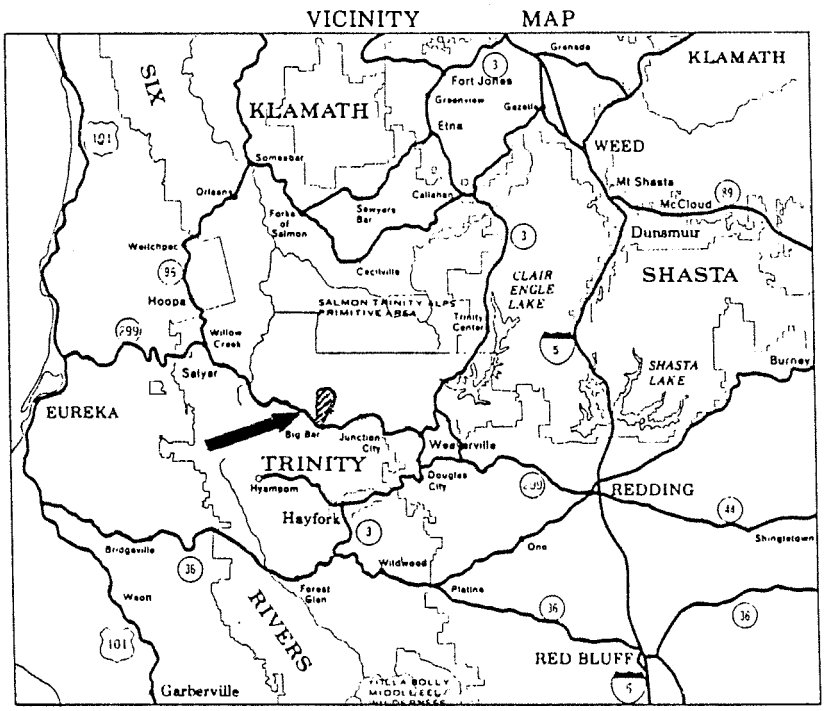
VIOLACEAE

Viola glabella Nutt. 185
Mixed conifer forest. Infrequent.

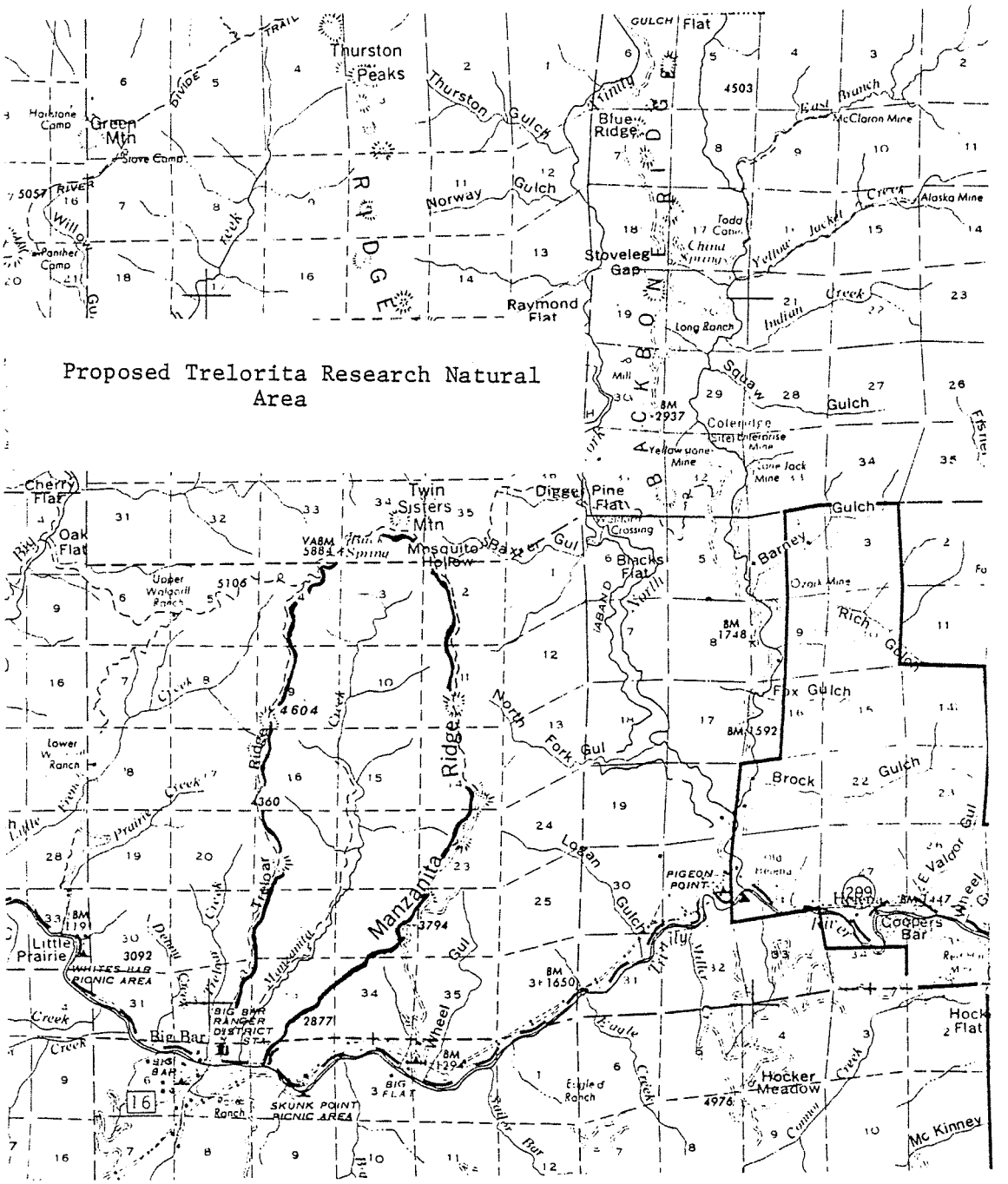
VITACEAE

o Vitis californica Benth. 969
Riparian. Frequent.

Map 1. Map showing the region where the proposed Trelorita (Manzanita Creek) Research Natural Area is located.



Map 2. Map showing the location of the proposed Trelorita (Manzanita Creek) Research Natural Area, Trinity County, California.



Map 3. Topographic Map (Helena 15' quadrangle) showing the Manzanita Creek drainage.

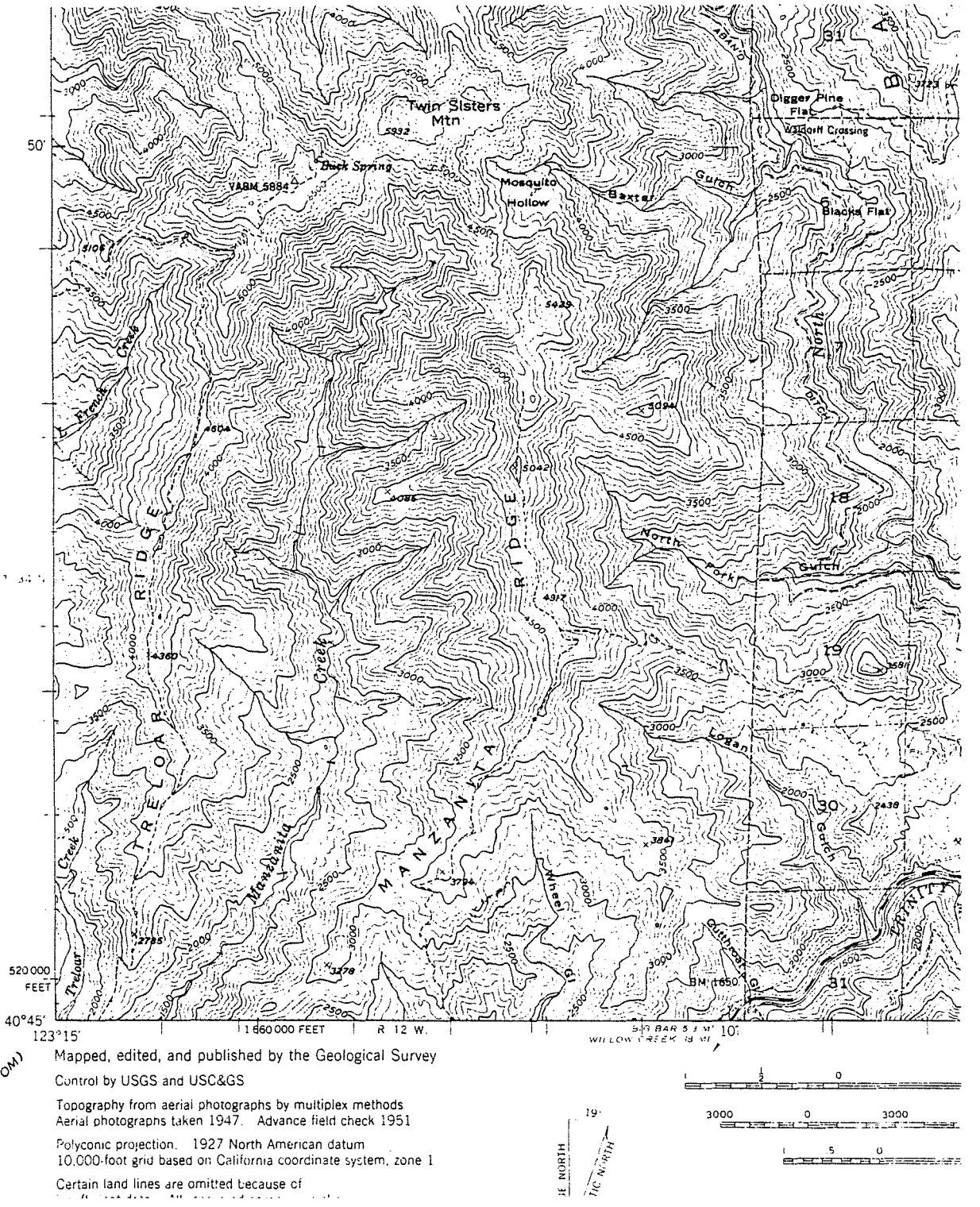


Table 1. Climatic summary for the Big Bar station.

LOC: Big Bar Ranger Station, Trinity County, California. 1200 feet elevation.
Data from 1953-1978, not including drought years of 1977 and 1976.
LAT: 40.45 N
MAX SS: 100 mm

	J	F	M	A	M	J	J	A	S	O	N	D	YR
T	4.1	5.8	8.7	11.6	15.8	20.0	23.7	23.0	20.1	14.5	8.2	4.8	13.4
PE	7	12	27	45	80	113	148	132	95	54	20	9	745
P	220	143	126	57	29	17	3	10	19	62	148	183	1018
SS	100	100	100	100	60	22	5	1	1	9	100	100	
AE	7	12	27	45	70	54	20	14	20	54	20	9	353
-					10	59	128	118	75				392
+	213	131	99	12						0	36	174	665

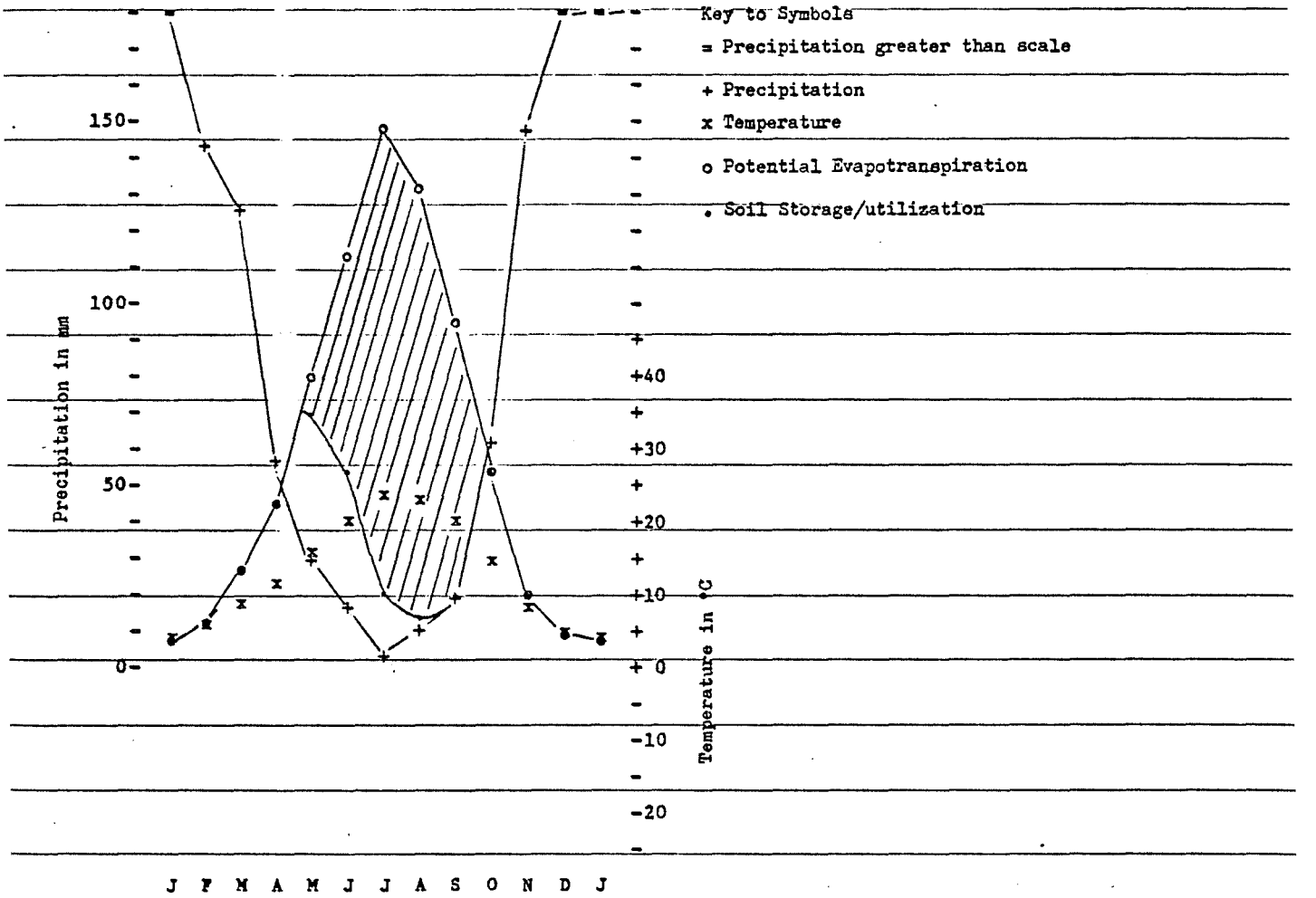


Table 2. Riparian and Seep vegetation associations of the Manzanita Creek drainage.

ALLIANCE		Alnus rhombifolia-Peltiphyllum peltatum									
ASSOCIATION		A. rhombifolia-Cornus sessilis							A. rhombifolia C. stolonifera		
RELEVE OR PLOT CODE		MNZ9	MNZ6	MNZP20	PNZ1	MNZ2	MNZP1	MNZP2	MNZ38	MNZ4	MNZ39
	Elevation(m)	493	457	501	365	365	441	457	1264	1264	1264
	Slope	3°	2°	1°	2°	2°	5°	1°	1°	1°	1°
TAXON	Aspect	NE	NNW	N	NE	SE	SSE	NNW	NE	NE	N
	Substrate	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm
ALNUS RHOMBIFOLIA		3	2	1	1	1	2	1	1	2	2
CORNUS SESSILIS		2	2	2	2	2	1	2			
PELTIPHYLLUM PELTATUM		2	2	+	+	1	1	1	+		1
ARALIA CALIFORNICA		2	2	+	+	2		1			
VITIS CALIFORNICA			+	+		1	1	1			
PHILADELPHIS LEWISII GORDONIANUS		1	1	1			1	+			
STACHYS MEXICANA			+			1	+	1			
FRAXINUS LATIFOLIA			+			1	1				
TAXUS BREVIFOLIA		1						+			
RUBUS LEUCODERMIS			+	+			+				
CAREX NUDATA						+	+	+			
RIBES ROEZELII							+	+			
TELLIMA GRANDIFLORA							+	+			
HYPERICUM PERFORATUM							+				
DRYOPTERIS DILATATA								+			
VERBASCUM THAPSUS							+	+			
CORNUS STOLONIFERA									2	2	2
RHODODENDRON OCCIDENTALE									2	1	3
SALIX COMMUTATA									2	2	+
CAREX AMPLIFOLIA									1	+	+
PYROLA ASARIFOLIA PURPUREA									+	+	
TORREYOCHLOA PALLIFLORA									1	1	
CAREX SUBFUSCA									+	+	+
HABENARIA DILATATA LEUCOSTACHYS									+	+	
ACER MACROPHYLLUM		1	2	2	2		2	2	+	1	
TOXICODENDRON DIVERSILOBUM		+		4	2		1				
CORYLUS CORNUTA CALIFORNICA				2	2				+	+	1
LONICERA HISPIDULA		+	1	+	2	1					
SYMPHORICARPOS MOLLIS			1	+	1	1	1	1			
ELYMUS GLAUCUS		1	+			1	+	+	+	+	
CRATAEGUS DOUGLASII						1					
ACER CIRCINATUM					1						
PSEUDOTSUGA MENZIESII			1		2	2	1				2
QUERCUS CHRYSOLEPIS				+	1	1	+	+			
RHAMNUS PURSHIANA			1								
ROSA PISOCARPA				+			1	+			
LIGUSTICUM CALIFORNICUM				+			+	+			
POLYSTICHUM MUNITUM IMBRICANS				+	+	+	+	+			
ARBUTUS MENZIESII					1	1					
DISPORUM HOOKERI TRACHYCARPUM					1			+			
RUBUS PARVIFLORUS						1			+	1	
PTERIDIUM AQUILINUM PUBESCENS								+	+	+	+
LISTERA CONVALLARIOIDES									+		
CLINTONIA UNIFLORA									+		

TABLE 3 ALLIANCE

	Pinus sabiniana	Pseudotsuga menziesii				Abies concolor						
ASSOCIATION	Pinus sabiniana–Cercis occidentalis & Ceanothus cuneatus	Quercus garryana	Pseudotsuga menziesii–Quercus chrysolepis	Pinus ponderosa–Quercus kelloggii	Pseudotsuga menziesii–Cornus nuttallii	Abies concolor–Pseudotsuga menziesii	Abies concolor–Acer glabrum	Abies concolor	Pinus attenuata–Quercus vaccinifolia	Salix lasiandra–Toxicoscordion myrsinites		
Plot or Releve Code	MNZP25 MNZP23 MNZP24 PAZ5 MNZA1 MNZA2 MNZP26 MNZB MNZJ2 MNZP17 MNZA8 MNZA MNZP15 MNZP19 MNZ7 MNZ1 MNZP18 MNZP1 MNZP3 MNZP2 MNZP16 MNZJ1 MNZP12 MNZP27 MNZP28 MNZP10 MNZP9 MNZA0 MNZP13 MNZP14 MNZP4 MNZP5 MNZ11 MNZ7WA MNZ71 MNZ72 MNZ73 MNZ74 MNZ75 MNZ76 MNZ77												
ELEVATION(m)	540	640	594	448	525	579	609	578	670	609	1066	763	579	762	457	409	762	440	1295	1280	609	1001	1755	1429	1447	1493	1478	1615	1665	1597	1322	1548	1603	1578	1443	1447	1432	1432	1396	1402	1520
SLOPE	28°	37°	30°	32°	35°	32°	35°	22°	10°	40°	20°	2°	15°	12°	17°	10°	30°	5°	3°	10°	12°	20°	5°	25°	40°	35°	30°	25°	35°	30°	16°	35°	10°	5°	22°	25°	24°	25°	21°	30°	29°
ASPECT	ESE	ESE	ESE	SSE	W	ESE	SW	NW	E	W	W	SW	WSW	E	ESE	WNW	ESE	SE	ESE	SE	SSE	N	NE	N	NE	NNE	NNW	NNW	NNW	NNW	W	W	SSW	S	NNW	NW	NW	NW	NNW	NNW	NNE
SUBSTRATE	PCm	PCm	PCm	PCm	PCm	Pcub	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm	PCm
PINUS SABINIANA	*	1	2			1	2																																		
CEANOTHUS CUNEATUS		1	1	4			2																																		
CERCIS OCCIDENTALIS	1	1	1	*	*	1	*		*							1																								
DAUCUS PUSILLUS	1	1	*		*	*	*									*																								
BROMUS TECTORUM	1		*		*		*																																	
CLEVOCARPUS BETULOIDES	1	1	1	R	*	*																																		
AIRA CARYOPHYLLEA	1	*	*		*		*																																	
ERIOGONUM VIMINEUM	*		*		*		*																																	
CLARKIA SP	*			*	*																																			
LILIUM PANICULATUM	1			*		*	*																																	
LESSINGIA HEMACLADA	*			*			*																																	
RHAMNUS CROCEA ILICIFOLIA	*			*			*																																	
LIDONICTYON CALIFORNICUM				*			*																																	
RHUS TRILOBATA QUINATA				1	*																																			
BROMUS MOLLIS				*																																				
BROMUS VOLUBILIS				*																																				
BROMUS RUBENS				*																																				
QUERCUS GARRYANA	1	1	*	*	1	1	2	4	4	5	2	1	*			1																									
LATHYRUS CF. JEPSONII CALIFORNICUS								*	*		*																														
MADIA ELEGANS			*							*																														
GERANIUM MOLLE										*																														
BROMUS DIANDRUS										1						1																									
PSEUDOTSUGA MENZIESII								R	*			1	2	2	2	4	2	4	2	2	4	2	4	3	4	1	1	1			2	R			*	1	*	*	1	2	1
SYMPHORICARPOS MOLLIS					*	*		*				1	*			*			*	1	*	2	2	2	1	1	2	3		2	1									
CORNUS NUTTALLII																							2	2	7																
QUERCUS CHRYSOLEPIS	*	2	2			1	1	*	*		3	2	*	4	4	*	4	2		2		1	*								*	R								
TOXICODENDRON DIVERSILOBUM	1	*	1	*		*	*	1	*	*		1	1	1	1	2	2	2			1	3																		
ACER MACROPHYLLUM														1	R	1			7	1		2	1								*							2		
POLYSTICHUM MUNITUM IMBRICANS								*			*	*	*	*	7	*																								
ARBUTUS MENZIESII		1							*			2	4	1		2	1	*	*			1																		
LONICERA HISPIDULA									1			2				2						1																			
PINUS PONDEROSA	*										R							2	3	3	2												*							
PINUS LAMBERTIANA												*	*					*	3	*		1																		
QUERCUS KELLOGGII								*			2					*		*	7	7	1	2																		
BROMUS MARGINATUS	*				*	3	3	*				2		*		*		1			7	*																		
PTERIDIUM AQUILINUM PUBESCENS																		*	1	1		*																		
CLEMATIS INTEGRIFOLIUS	*										2					*		*				*						1												
IRIS TENUISSIMA												1						*	*			*																		
PTEROSPORA ANDROMEDEA																		*	*																					
VIOLA GLABELLA																						*																		
POLYGALA CORNUTA													*				R																							
HIERACIUM GREENEI												*		*	*	*		*				*			*	*				*										
PYROLA PICTA																																								
GOODYERA OBLONGIFOLIA																				1																				
LATHYRUS POLYPHYLLUS																*																							
BERBERIS NERVOSA																																							
OSMORHIZA CHILENSIS																			1	1					*	*				1	1	*							
GALIUM TRIFLORUM																									*	*														
CHIMAPHILA MENZIESII																						+	+		1	1	*	1			*	1		*					
HIERACIUM ALBIFLORUM																			1	1		*	*			*		*											
PINUS ATTENUATA																																4	5	4						
QUERCUS VACCINIFOLIA																							1		R	2						3	5	5						
PLEDICULARIS DENSIFLORA																																	*	*						
APOCYNUM PUMILUM																				1													*	*						
ABIES CONCOLOR																						2	7	2	1	5	5	3	4	4	5	*	*	*	*	*	1	1	1
CORYLUS CORNUTA CALIFORNICA																		1	2	2		1		*	7			*			1				*	2	1	1	2	1
CLYMUS GLAUCUS								*						1	*													1	1	7					*	1	*	*	*	*	
AMELANCHIER PALLIDA																				2				1				*		1		1	+	*		*	*	*	*	
ROSA PISOCARPA																						2	*	*	*			1	1	7						1	1	1	1	
TRIENTALIS LATIFOLIA												1		*	*									*	*	*									*	*	*	*	*	*
GARRYA FREMONTII	*			*		*																		1						1					2	1	2	2	4	2
DISPORUM HOOKERI TRACHYCARPUM																						*	*		*	*	*	*	2	2					*					
RUBUS PARVIFLORUS																								1	7				2	3					*	*	1	1	*	1
LONICERA CILIOSA																											2	1	*	7					1	*	1	*	*	*
RIBES NEVADENSE																							1	2				1	2	7					1	*	1	1	*	1
SMILACINA RACEMOSA AMPLEXICAULIS																												*	1						*					
ADENOCAULON BICOLOR																						*		*		1	2	1							*					
ACER GLABRUM																										1		7	3	3					2		2	2	2	1
PAXISTIMA MYRSINITES																																			1	1	*	*	*	*	1
SALIX JEPSONII																																			2	2	*	1	3	2	2
CAMPANULA PREMANTHOIDES																																			*	*	*			*	*
EUONYMUS OCCIDENTALIS																																							1		
ERYTHRONIUM CALIFORNICUM																																			*	*	*			*	*
LUPATORIUM OCCIDENTALE																																			1	*					
LIGUSTICUM CALIFORNICUM																						1						*							*	*	*	*	*	1	1
RHAMNUS PURSHIANA																																			*						
ACTAEA RUBRA																												*	1	*									*	
SAMBUCUS MELANOCARPA																												1	*			*							*	
MITELLA TRIFIDA																												*	*											
AQUILEGIA FORMOSA TRUNCATA																												*	*	1										
LUPINUS LATIFOLIUS																													*											
PENSTEMON ANGUSTUS																												*	*	*										
CASTILLEJA MINIATA																												*	*											
AGASTACHE URTICIFOLIA																												1												
SUMBUS SCOPULINA																												1												
CHAMAENERION ANGUSTIFOLIUM																												*												

Table 4

ALLIANCE	Quercus vaccinifolia						Holodiscus microphyllus-Penstemon corymbosus								
ASSOCIATION	Cercocarpus betuloides macrourus						H. microphyllus-Erog. compositum		H. microphyllus-Silene grayi				H. microphyllus-Lewisia cotyledon		
Releve or Plot Code	M N Z 2 2	M N Z 2 3	M N Z 2 4	M N Z 2 6	M N Z 1 6	M N Z 1 3	M N Z 1 7	M N Z 2 3	M N Z 2 7	M N Z 2 8	M N Z 2 9	M N Z 3 0	M N Z 1 9	M N Z 2 0	M N Z 2 1
ELEVATION(m)	1548	1514	1459	1816	1478	1085	1597	1595	1810	1805	1800	1800	1554	1550	1493
SLOPE	40°	35°	40°	5°	30°	20°	35°	17°	10°	12°	10°	20°	80°	75°	50°
ASPECT	NW	WNW	WNW	E	SSE	SW	NNW	ESE	NE	NNW	N	N	WSW	WSW	WSW
SUBSTRATE	PCmv	PCmv	PCmv	PCm	PCm	PCmv	PCub	PCm	PCmv	PCmv	PCmv	PCm	PCm	PCmv	PCmv
Taxon															
CERCOCARPUS BETULOIDES MACROURUS	2	2	3	2	2										
ARCTOSTAPHYLOS PATULA	2	1	+		2										
PRUNUS EMARGINATA	1	1	+	1	+										
CEANOTHUS CORDULATUS	+	1	+												
LILIUM WASHINGTONIANUM	+	+													
ROSA PISOCARPA		+													
CEANOTHUS INTEGERRIMUS	1				1										
GARRYA FREMONTII	+		2	2	2										
AMELANCHIER PALLIDA	+	2	1												
QUERCUS GARRYANA BREWERI			+		+										
ARCTOSTAPHYLOS MANZANITA															
SYMPHORICARPOS MOLLIS		+													
HOLODISCUS MICROPHYLLUS							2	1	2	2	1	1	1	1	2
ERIOGONUM COMPOSITUM							1	2				+	+	+	+
PENSTEMON CORYMBOSUS									+	+	1	+	1	+	1
ERIOGONUM UMBELLATUM POLYANTHUM		+	1	+	1		1		2	1	2				
HEUCHERA MICRANTHA									+				1	+	R
SITANION HYSTRIX					+	2	+	1	1	+	+	+	+	+	1
MELICA CALIFORNICA									+	1	+	+			
SEDUM OBTUSATUM BOREALE						+	+	+		+	1	+	+	+	+
PENSTEMON DEUSTUS					+			+	+	1	1	+	+	+	
CHEILANTHES GRACILLIMA					+			+	1	1	+		+	+	+
ARENARIA NUTTALLII GREGARIA							1	1			+	+	+		+
PHACELIA MUTABILIS					+	+				+	+	1			
LOMATIUM MACROCARPUM					+	+			+	1		+			
CREPIS ACUMINATA					+				+	+		+			
ERIOGONUM NUDUM OBLONGIFOLIUM					+	1		+							
LEPTODACTYLON PUNGENS HOOKERI							+	1							
PENSTEMON HETEROPHYLLUS					+	+	1	+							
ERIOPHYLLUM LANATUM LANCEOLATUM					+	1	+								
MONARDELLA ODORATISSIMA PALLIDA						1				+	1	+			
CHRYSOTHAMNUS PARRYI LATIOR						+			+		+	+			
SILENE GRAYI										+	1	1			
LUNIA HYPOLEUCA										+	+	+			
PENSTEMON NEWBERRYI BERRYI									+	+		+			
GALIUM GRAYANUM										+	+	+			
CHAENACTIS DOUGLASII										+	+				
SELAGINELLA WALLACEI						+							+	+	+
LEWISIA COTYLEDON HECKNERI													+	1	1
STREPTANTHUS TORTUOSUS PALLIDUS													+	+	+
ZAUSCHNERIA CALIFORNICA LATIFOLIA													+	+	1
PELLAEA BRACHYPTERA													+	R	+
POLYSTICHUM MUNITUM IMBRICANS	+	+													
SMILACINA RACEMOSA AMPLEXICAULIS	+		+												
APOCYNUM PUMILUM															
CASTILLEJA APPLEGATEI							1			+					
ANGELICA ARGUTA		+	+												
ACHILLEA LANULOSA						+									

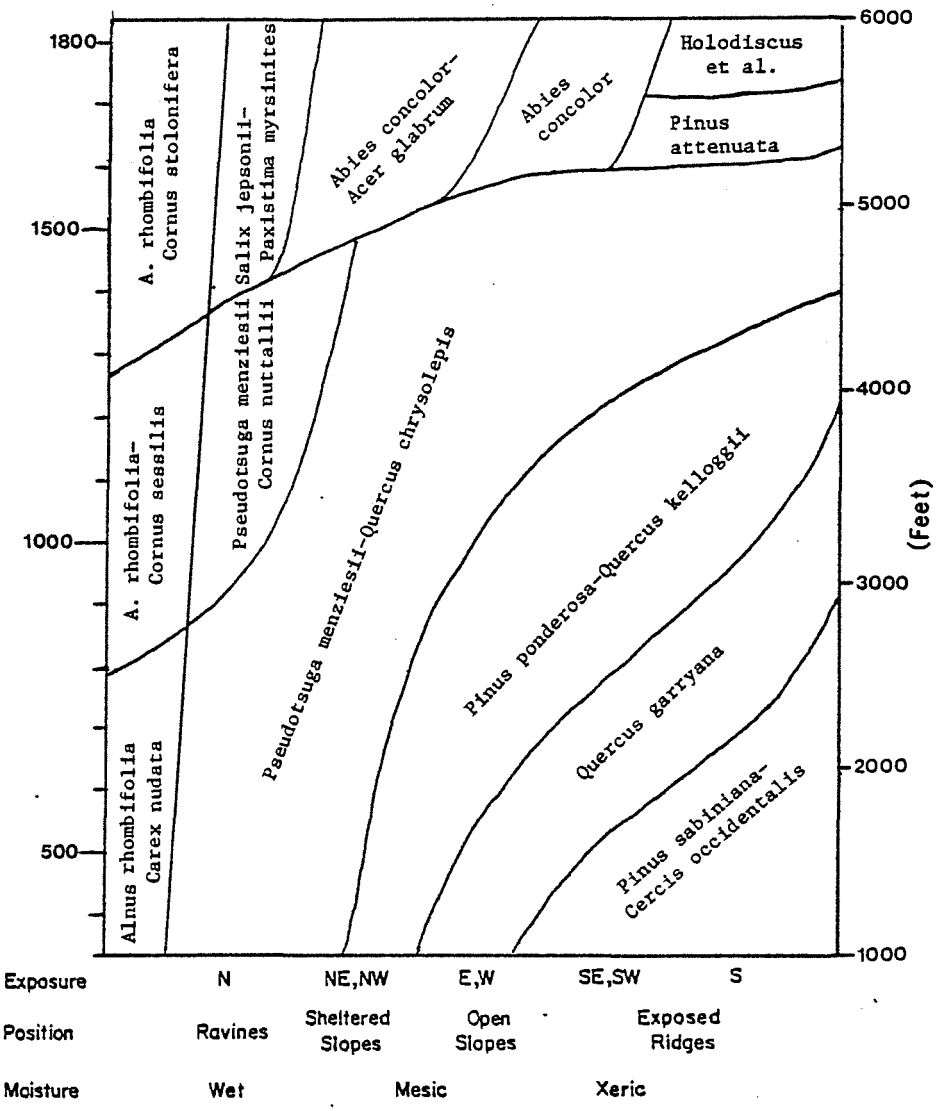
Table 5. Plot summary for the various forest stand-types on the proposed Trelorita (Manzanita Creek) Research Natural Area. Upper Value is the grand mean for the plots, and the lower value is the Coefficient of Variation in %.

Taxon	Basal Area (m^2/ha)	Rel. Dom.	Dens. (stems/ ha)	Rel. Dens	Impt. Val.	$\bar{X}$ D.B.H.
5A. Alnus rhombifolia-Cornus sessilis association. Plots 20,21,22.						
Alnus rhombifolia	23.7	43.5	159.0	15.6	59.1	38.6
	(103)	(48)	(87)	(72)	(53)	(13)
Pseudotsuga menziesii	13.2	24.2	126.6	15.3	39.0	31.0
	(63)	(38)	(50)	(100)	(52)	(41)
Acer macrophyllum	7.8	20.6	169.6	15.9	36.3	27.2
	(290)	(85)	(78)	(64)	(40)	(33)
Cornus sessilis	0.3	1.1	371.4	35.3	36.4	2.2
	(138)	(158)	(65)	(50)	(53)	(55)
Quercus kelloggii	3.1	7.0	63.3	9.0	16.4	5.7
	(174)	(174)	(174)	(174)	(174)	(174)
Q. chrysolepis	0.6	1.7	84.8	7.3	9.1	6.8
	(90)	(131)	(114)	(114)	(118)	(94)
Taxus brevifolia	0.3	1.3	21.2	1.8	3.1	4.6
	(174)	(174)	(174)	(174)	(174)	(174)
5B. Pinus sabiniana-Cercis occidentalis association. Plots 23-26.						
Pinus sabiniana	21.5	80.5	119.3	21.1	72.8	30.1
	(96)	(20)	(70)	(22)	(69)	(100)
Quercus garryana	3.5	30.8	182.9	33.7	64.5	9.6
	(102)	(139)	(80)	(100)	(114)	(71)
Q. chrysolepis	1.9	12.1	357.7	50.7	62.8	7.1
	(77)	(96)	(55)	(42)	(47)	(16)
5C. Quercus garryana association. Plot 17.						
Quercus garryana	21.9	100.0	763.9	100.0	200.0	17.2
	-	-	-	-	-	-

Table 5 continued.	BA	RD	D	RD	IV	$\bar{X}$
5D. Pseudotsuga menziesii-Quercus chrysolepis association. Plots 15,18,19.						
Quercus chrysolepis	9.2	22.0	593.9	44.6	66.7	9.6
	(86)	(91)	(78)	(83)	(82)	(55)
Pseudotsuga menziesii	20.4	45.9	254.9	16.4	62.4	30.1
	(55)	(48)	(37)	(18)	(82)	(55)
Arbutus menziesii	9.3	19.5	477.0	26.7	46.3	12.0
	(135)	(135)	(135)	(135)	(148)	(94)
Pinus ponderosa	3.6	7.8	10.6	0.5	8.4	22.1
	(173)	(173)	(173)	(173)	(173)	(173)
Quercus garryana	0.7	1.6	10.6	0.5	2.1	10.0
	(173)	(173)	(173)	(173)	(173)	(173)
Acer macrophyllum	0.9	2.5	137.9	9.4	11.9	2.4
	(173)	(173)	(173)	(173)	(173)	(173)
Quercus kelloggii	0.1	0.3	10.6	0.8	1.1	4.5
	(180)	(180)	(180)	(180)	(180)	(180)
Pinus lambertiana	.03	.06	10.6	0.5	0.6	2.0
	(170)	(170)	(170)	(170)	(170)	(170)
5E. Pinus ponderosa-Quercus kelloggii association. Plots 1,2,3,16.						
Pseudotsuga menziesii	34.8	34.5	310.1	53.5	88.0	26.5
	(121)	(117)	(82)	(61)	(78)	(88)
Pinus ponderosa	62.5	50.7	190.9	31.4	82.2	60.4
	(73)	(68)	(78)	(72)	(66)	(31)
Pinus lambertiana	18.7	11.3	5.9	3.2	14.5	29.7
	(200)	(200)	(200)	(200)	(200)	(200)
Quercus kelloggii	2.4	2.4	47.7	6.3	8.8	15.3
	(135)	(135)	(135)	(135)	(135)	(135)
Q. chrysolepis	0.5	0.5	15.9	4.1	4.6	3.7
	(200)	(200)	(200)	(200)	(200)	(200)
Acer macrophyllum	0.0	0.0	7.9	1.0	1.0	10.3
	(200)	(200)	(200)	(200)	(200)	(200)
5F. Pseudotsuga menziesii-Cornus nuttallii assiciation. Plots 7,8,12.						
Abies concolor	19.6	33.1	403.1	53.6	86.8	18.1
	(111)	(150)	(152)	(54)	(78)	(115)
Pseudotsuga menziesii	67.1	61.5	106.0	23.3	84.6	73.6
	(100)	(75)	(62)	(100)	(75)	(48)
Cornus nuttallii	0.5	0.5	116.4	21.5	22.1	5.7
	(79)	(86)	(57)	(40)	(40)	(47)
Pinus lambertiana	8.1	3.4	8.0	0.5	4.0	24.7
	(174)	(174)	(174)	(174)	(174)	(174)
Acer macrophyllum	0.3	0.1	8.0	0.5	0.6	5.2
	(174)	(174)	(174)	(174)	(174)	(174)

Table 5 concluded.	BA	RD	D	RD	IV	$\bar{X}$
5G. Abies-Pseudotsuga association. Plots 9,10.						
Abies concolor	50.0	93.3	34.9	72.0	165.1	40.3
	(19)	(04)	(64)	(43)	(21)	(29)
Pseudotsuga menziesii	3.3	6.5	31.8	7.0	13.6	36.1
	(47)	(60)	(0)	(25)	(45)	(24)
Acer glabrum	0.0	0.0	79.5	20.8	20.8	0.4
	(159)	(141)	(141)	(141)	(141)	(141)
5H. Abies concolor-Acer glabrum association. Plots 13,14.						
Abies concolor	90.3	97.5	238.7	38.4	136.1	63.3
	(45)	(63)	(09)	(05)	(01)	(29)
Acer glabrum	1.4	2.2	381.7	61.5	63.8	2.8
	(136)	(139)	(0)	(03)	(01)	(81)
5I. Abies concolor association. Plot 4.						
Abies concolor	40.9	87.9	509.2	88.8	176.7	22.3
	-	-	-	-	-	
Pseudotsuga menziesii	5.6	12.0	63.6	11.1	23.2	33.5
	-	-	-	-	-	-
5J. Pinus attenuata-Quercus vaccinifolia association. Plots 5,6,11.						
Pinus attenuata	34.4	99.1	594.1	90.4	189.6	26.5
	(32)	(01)	(40)	(14)	(07)	(05)
Abies concolor	0.1	0.4	32.1	5.6	5.7	5.0
	(90)	(103)	(100)	(120)	(120)	(89)
Pinus lambertiana	0.1	0.4	21.2	4.1	4.5	2.1
	(184)	(206)	(173)	(176)	(176)	(173)

Figure 1. Generalized relationships of the major vegetation types of the Manzanita Creek drainage to the topographic moisture gradient.



STAND No.=MNZP1
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pseudotsuga menziesii	91.271	84.89	286.47	75.0	159.8	60.0
Pinus ponderosa	14.062	13.08	31.83	8.3	21.4	75.0
Quercus chrysolepis	2.177	2.02	63.66	16.6	18.6	15.1
TOTALS	107.511		381.97			

BASAL AREA PROGRAM
STAND No.=MNZP2
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pinus ponderosa	114.166	96.97	222.81	50.0	146.9	74.6
Pseudotsuga menziesii	3.559	3.02	222.81	50.0	53.0	9.4
TOTALS	117.726		445.63			

BASAL AREA PROGRAM
STAND No.=MNZP3
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pinus ponderosa	86.875	52.51	381.97	52.1	104.6	35.2
Pseudotsuga menziesii	.825	.49	63.66	8.6	9.1	11.0
Pinus lambertiana	74.945	45.30	95.49	13.0	58.3	59.4
Quercus kelloggii	2.777	1.67	159.15	21.7	23.4	8.1
Acer macrophyllum	.003	.00	31.83	4.3	4.3	1.2
TOTALS	165.427		732.11			

BASAL AREA PROGRAM
STAND No.=MNZP4
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Abies concolor	40.938	87.90	509.29	88.8	176.7	22.3
Pseudotsuga menziesii	5.631	12.09	63.66	11.1	23.2	33.5
TOTALS	46.569		572.95			

BASAL AREA PROGRAM
STAND No.=MNZP5
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Pinus attenuata	24.879	97.84	381.97	75.0	172.8	27.9
Pinus lambertiana	.324	1.27	63.66	12.5	13.7	6.4
Abies concolor	.222	.87	63.66	12.5	13.3	6.5
TOTALS	25.427		509.29			

BASAL AREA PROGRAM
STAND No.=MNZP6
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Pinus attenuata	46.876	99.60	859.43	96.4	196.0	25.2
Abies concolor	.184	.39	31.83	3.5	3.9	8.6
TOTALS	47.061		891.26			

BASAL AREA PROGRAM
STAND No.=MNZP7
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Abies concolor	43.191	90.49	190.98	66.6	157.1	48.6
Pseudotsuga menziesii	4.473	9.37	31.83	11.1	20.4	42.3
Acer glabrum	.064	.13	63.66	22.2	22.3	3.0
TOTALS	47.730		286.47			

BASAL AREA PROGRAM
STAND No.=MNZP8
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Pseudotsuga menziesii	60.266	98.63	159.15	50.0	148.6	66.6
Abies concolor	.190	.31	63.66	20.0	20.3	5.7
Cornus nuttallii	.645	1.05	95.49	30.0	31.0	8.5
TOTALS	61.102		318.30			

Appendix 1 continued.

BASAL AREA PROGRAM
STAND No.=MNZP9
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Abies concolor	43.191	90.59	190.98	50.0	140.5	48.6
Pseudotsuga menziesii	4.473	9.38	31.83	8.3	17.7	42.3
Acer glabrum	.009	.01	159.15	41.6	41.6	.8
TOTALS	47.674		381.97			

BASAL AREA PROGRAM
STAND No.=MNZP10
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Abies concolor	56.984	96.20	509.29	94.1	190.3	32.0
Pseudotsuga menziesii	2.249	3.79	31.83	5.8	9.6	30.0
TOTALS	59.234		541.12			

BASAL AREA PROGRAM
STAND No.=MNZP11
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Pinus attenuata	31.697	100.00	541.12	100.0	200.0	26.6
TOTALS	31.697		541.12			

BASAL AREA PROGRAM
STAND No.=MNZP12
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Pseudotsuga menziesii	136.807	76.52	127.32	8.5	85.0	112.7
Abies concolor	15.542	8.69	1114.08	74.4	83.1	6.4
Acer macrophyllum	1.102	.61	31.83	2.1	2.7	21.0
Cornus nuttallii	.822	.46	190.98	12.7	13.2	5.8
Pinus lambertiana	24.502	13.70	31.83	2.1	15.8	99.0
TOTALS	178.777		1496.05			

Appendix 1 continued.

BASAL AREA PROGRAM
STAND No.-MNZP13
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Abies concolor	61.300	95.52	254.64	40.0	135.5	50.2
Acer glabrum	2.870	4.47	381.97	60.0	64.4	4.5
TOTALS	64.171		636.61			

BASAL AREA PROGRAM
STAND No.-MNZP14
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Abies concolor	119.726	99.95	222.81	36.8	136.7	76.4
Acer glabrum	.052	.04	381.97	63.1	63.2	1.2
TOTALS	119.778		604.78			

BASAL AREA PROGRAM
STAND No.-MNZP15
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pseudotsuga menziesii	9.912	21.05	350.14	18.9	40.0	14.3
Pinus ponderosa	11.071	23.51	31.83	1.7	25.2	66.5
Pinus lambertiana	.092	.19	31.83	1.7	1.9	6.0
Arbutus menziesii	23.655	50.23	1336.90	72.4	122.6	13.7
Quercus garryana	2.284	4.85	31.83	1.7	6.5	30.2
Quercus chrysolepis	.068	.14	63.66	3.4	3.5	3.5
TOTALS	47.084		1846.19			

BASAL AREA PROGRAM
STAND No.-MNZP16
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pseudotsuga menziesii	44.010	50.96	668.45	80.7	131.7	25.7
Pinus ponderosa	35.231	40.79	127.32	15.3	56.1	56.8
Quercus kelloggii	7.112	8.23	31.83	3.8	12.0	53.3
TOTALS	86.354		827.60			

BASAL AREA PROGRAM
STAND No.-MNZP17
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Quercus garryana	21.945	100.00	763.94	100.0	200.0	17.2
TOTALS	21.945		763.94			

BASAL AREA PROGRAM
STAND No.-MNZP18
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pseudotsuga menziesii	32.345	63.93	159.15	13.1	77.0	49.5
Quercus chrysolepis	13.492	26.66	923.09	76.3	102.9	12.1
Quercus kelloggii	.470	.92	31.83	2.6	3.5	13.7
Arbutus menziesii	4.286	8.47	95.49	7.8	16.3	22.4
TOTALS	50.595		1209.57			

BASAL AREA PROGRAM
STAND No.-MNZP19
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pseudotsuga menziesii	19.278	52.84	254.64	17.3	70.2	26.6
Quercus chrysolepis	14.443	39.59	795.77	54.3	93.9	13.3
Acer macrophyllum	2.757	7.55	413.80	28.2	35.8	7.3
TOTALS	36.479		1464.22			

BASAL AREA PROGRAM
STAND No.-MNZP20
PLOT RADIUS= 7.070
PLOT AREA = 157.07 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Alnus oregana	59.759	67.65	318.31	27.7	95.4	32.7
Acer macrophyllum	7.319	8.28	318.31	27.7	36.0	17.0
Cornus sessilis	.080	.09	318.31	27.7	27.8	1.7
Pseudotsuga menziesii	20.363	23.05	127.32	11.1	34.1	45.0
Quercus chrysolepis	.806	.91	63.66	5.5	6.4	12.7
TOTALS	88.328		1145.94			

BASAL AREA PROGRAM
STAND No.-MNZP21
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Alnus oregana	14.156	31.33	95.49	13.6	44.9	43.0
Quercus kelloggii	9.541	21.12	190.98	27.2	48.3	17.1
Pseudotsuga menziesii	15.559	34.44	190.98	27.2	61.7	19.6
Acer macrophyllum	5.864	12.98	63.66	9.0	22.0	34.1
Cornus sessilis	.051	.11	159.15	22.7	22.8	1.8
TOTALS	45.172		700.28			

BASAL AREA PROGRAM
STAND No.-MNZP22
PLOT RADIUS= 7.070
PLOT AREA = 157.03 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Alnus oregana	8.055	31.71	63.68	5.5	37.2	40.1
Acer macrophyllum	10.373	40.84	127.36	11.1	51.9	32.1
Quercus chrysolepis	1.106	4.35	191.04	16.6	21.0	7.8
Taxus brevifolia	.976	3.84	63.68	5.5	9.3	13.9
Pseudotsuga menziesii	4.047	15.93	63.68	5.5	21.4	28.4
Cornus sessilis	.836	3.29	636.81	55.5	58.8	3.6
TOTALS	25.395		1146.26			

BASAL AREA PROGRAM
STAND No.-MNZP23
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pinus sabiniana	4.374	56.14	159.15	20.8	76.9	12.1
Quercus garryana	1.171	15.03	127.32	16.6	31.6	9.4
Quercus chrysolepis	2.245	28.82	477.46	62.5	91.3	6.4
TOTALS	7.791		763.94			

BASAL AREA PROGRAM
STAND No.-MNZP24
PLOT RADIUS= 10.000
PLOT AREA = 314.15 meters

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	X DBH
Pinus sabiniana	29.999	88.35	190.98	26.0	114.4	40.5
Quercus chrysolepis	3.953	11.64	541.12	73.9	85.5	8.8
TOTALS	33.952		732.11			

Appendix 1 continued.

BASAL AREA PROGRAM
STAND No.-MNZP25
PLOT RADIUS= 10.000 m
PLOT AREA = 314.15 meters^2

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Quercus garryana	5.168	94.31	286.47	75.0	169.3	14.5
Quercus chrysolepis	.311	5.68	95.49	25.0	30.6	6.3
TOTALS	5.479		381.97			

BASAL AREA PROGRAM
STAND No.-MNZP26
PLOT RADIUS= 10.000 m
PLOT AREA = 314.15 meters^2

TAXON	BA (m^2/ha)	REL. DOM.	DENS. (#/ha)	REL. DENS.	IMP. VAL.	$\bar{X}$ DBH
Pinus sabiniana	47.080	83.38	127.32	16.6	100.0	67.9
Quercus garryana	7.930	14.04	318.30	41.6	55.7	14.6
Quercus chrysolepis	1.450	2.56	318.30	41.6	44.2	7.3
TOTALS	56.461		763.94			

Appendix 2.

Typification of the vegetation associations sampled on the proposed Trelorita (Manzanita Creek) Research Natural Area. The Code of Phytosociological Nomenclature requires that vegetation syntaxa described in the literature for the first time after 1 January 1979 follow the rules setforth therein (cf. Vegetatio Vol. 32:131-185.). Unlatinized names for the vegetation types below can be referenced in Tables 2, 3 and 4.

1. ALLIANCE Pinio sabinanea All. Nov. Taylor 1979

   Nomenclatural Type: Cercio-Pinetum sabinianeae Taylor 1979
   Alliance Diagnostic Taxa: Pinus sabiniana, Cercis occidentalis.

   1. ASSOCIATION Cercio-Pinetum sabinianeae Assoc. Nov. Taylor 1979

      Nomenclatural Type: Table 3, Releve MNZP 26
      Association Diagnostic Taxa: Pinus sabiniana, Cercis occidentalis, Rhamnus crocea, Daucus pusillus.

   2. ASSOCIATION Ceanothetum cuneateae Assoc. Nov. Taylor 1979

      Nomenclatural Type: Table 3, Releve MNZ 5
      Association Diagnostic Taxa: Ceanothus cuneatus.

2. ALLIANCE Pseudotsugion menziesii All. Nov. Taylor 1979

   Nomenclatural Type: Pinio-Pseudotsugetum menziesii Taylor 1979
   Alliance Diagnostic Taxa: Pseudotsuga menziesii, Pinus ponderosa, Quercus chrysolepis, Pinus lambertiana, Toxicodendron diversilobum.

   3. ASSOCIATION Quercetum garryanae Assoc. Nov. Taylor 1979

      Nomenclatural Type: Table 3, Releve MNZ 12.
      Association Diagnostic Taxa: Quercus garryana, Lathyrus jepsonii californicus, Bromus marginatus

   4. ASSOCIATION Querco-Pseudotsugetum menziesii Assoc. Nov. Taylor 1979

      Nomenclatural Type: Table 3, Releve MNZP 19
      Association Diagnostic Taxa: Pseudotsuga menziesii, Quercus chrysolepis, Toxicodendron diversilobum, Arbutus menziesii

   5. ASSOCIATION Querco-Pinetum ponderoseae Assoc. Nov. Taylor 1979

      Nomenclatural Type: Table 3, Releve MNZP 2
      Association Diagnostic Taxa: Quercus kelloggii, Pinus ponderosa, Pinus lambertiana, Pteridium aquilinium pubescens, Iris tenuisissima.

3. ALLIANCE Abieti concolroion All. Nov. Taylor 1979

Nomenclatural Type: Aceri-Abietum concolori Taylor 1979
Alliance Diagnostic Taxa: Abies colcolor, Corylus cornuta californica, Rosa pisocarpa, Trientalis latifolia, Amelanchier pallida, Chimaphila menziesii, Osmorhiza chilensis, Heiracium albiflorum.

6. ASSOCIATION Corno-Pseudotsugetum menziesii Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 3, Releve MNZP 8
Association Diagnostic Taxa: Cornus nuttallii, Pseudotusga menziesii, Galium triflorum

7. ASSOCIATION Abiete-Pseudotsugetum menziesii Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 3, Releve MNZ 40
Association Diagnostic Taxa: Abies concolor, Pseudotsuga menziesii, Quercus vaccinifolia, Chimaphila menziesii, Diasporum hookeri trachycarpum.

8. ASSOCIATION Aceri-Abietum concolori Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 3, Releve MNZP 13
Association Diagnostic Taxa: Acer glabrum, Sambucus melanocarpa, Mitella trifida, Penstemon anguineus, Actea rubra arguta.

9. ASSOCIATION Abietum concolori Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 3, Releve MNZP 4
Association Diagnostic Taxa: Abies concolor, Quercus chrysolepis.

10. ASSOCIATION Querco-Pinetum attenuateae Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 3, Releve MNZP 11
Association Diagnostic Taxa: Pinus attenuata, Quercus vaccinifolia.

11. ASSOCIATION Paxistimo-Salicetum jepsonii Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 3, Releve MNZ 31
Association Diagnostic Taxa: Salix jepsonii, Paxistima myrsinites, Euonymus occidentalis, Erythronium californicum, Eupatorium occidentale.

4. ALLIANCE Quercion vaccinifoliae All. Nov. Taylor 1979

Nomenclatural Type: Cercocarpo macroureae Taylor 1979
Alliance Diagnostic Taxa: Quercus vaccinifolia, Cercocarpus betuloides macrourus.

12. ASSOCIATION Cercocarpetum macroureae Assoc. Nov. Taylor 1979
Nomenclatural Type: Table 4, Releve MNZ 24
Association Diagnostic Taxa: Cercocarpus betulioides macrourus.

5. ALLIANCE Penstemoo-Holodiscion microphyllae All, Nov, Taylor 1979

Nomenclatural Type: Sileno-Holodiscetum microphylleae Taylor 1979
Alliance Diagnostic Taxa: Holodiscus microphyllus, Eriogonum compositum, Sitanion hystrix, Sedum obtusatum boreale, Cheilanthes gracillima, Arenaria nuttallii gregaria, Penstemon corymbosus.

13. ASSOCIATION Eriogono-Holodiscetum microphyllae Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 4, Releve MNZ 43
Association Diagnostic Taxa: Eriogonum compositum, Leptodactylon pungens hookeri.

14. ASSOCIATION Sileno-Holodiscetum microphyllae Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 4, Releve MNZ 30
Association Diagnostic Taxa: Silene grayi, Lunia hypoleuca, Penstemon newberryi berryi, Galium grayanum.

15. ASSOCIATION Lewisio-Holodiscetum microphyllae Assoc. Nov. Taylor 1979

Nomenclatural Type; Table 4, Releve MNZ 19
Association Diagnostic Taxa: Selaginella wallacei, Lewisia cotyledon heckneri, Zauschneria californica latifolia, Pellea brachyptera.

6. ALLIANCE Peltiphyllo-Alnuetalia rhombifolii Taylor 1979

Nomenclatural Type; Galio-Alnetum rhombifolii Taylor 1979
Alliance Diagnostic Taxa: Alnus rhombifolia, Aralia californica, Stachys mexicana, Carex nudata.

16. ASSOCIATION Cornetum sessilis Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 2, Releve MNZ 9
Association Diagnostic Taxa: Cornus sessilis, Vitus californica, Fraxinis latifolia.

17. ASSOCIATION Corno-Alnetum rhombifolii Assoc. Nov. Taylor 1979

Nomenclatural Type: Table 2, Releve MNZ 38
Association Diagnostic Taxa: Cornus stolonifera, Rhododendron occidentale, Salix commutata, Carex amplifolia.

Appendix 3. Climatic Means for the Big Bar Station.

Since the weather data for the Big Bar Station have not been summarized, it was necessary to assemble the data base to calculate the monthly water balance shown in Table 1. The table below summarizes the 1953-1978 data (with the recent drought years of 1976-1977 omitted).

n = number of years of record

mean = mean for n given

s. d. = Standard Deviation

c. v. = Coefficient of Variation (as proportion of mean)

Big Bar Ranger Station Temperature F

	n	mean	s.d.	c.v.
JAN	22	39.422	2.486	.063
FEB	23	42.508	9.649	.227
MAR	21	47.642	2.443	.051
APR	21	52.990	3.126	.058
MAY	24	60.454	2.653	.043
JUN	23	68.019	2.768	.040
JUL	23	74.743	2.640	.035
AUG	25	73.472	2.297	.031
SEP	24	68.283	2.680	.039
OCT	24	58.155	2.684	.046
NOV	22	46.736	2.805	.060
DEC	20	40.695	3.531	.086

Big Bar Ranger Station Precipitation Inches

	n	mean	s.d.	c.v.
JAN	24	8.666	4.646	.536
FEB	24	5.649	3.963	.701
MAR	24	4.964	3.177	.639
APR	24	2.255	1.726	.765
MAY	22	1.161	1.390	1.197
JUN	24	.651	.905	1.389
JUL	23	.130	.236	1.810
AUG	24	.405	.556	1.371
SEP	24	.750	.876	1.168
OCT	24	2.470	2.193	.887
NOV	24	5.827	3.959	.679
DEC	24	7.204	4.970	.689

Voucher specimens collected in the Manzanita Creek watershed, Trinity County, California. The following specimens are deposited at the University of California, Davis, herbarium (DAV). Duplicates have been sent to Humboldt State University (HSU) and the University of Colorado (COLO). The numbers are Dean Wm. Taylor's collection numbers.

7664 HSU Stachys mexicana Benth.

7665 COLO Adiantum pedatum L. var. aleuticum Rupr.

7666 HSU Lonicera hispidula Dougl. var. vascillans Gray

7667 HSU Aruncus vulgaris Raf.

7668 Epilobium paniculatum Nutt. ex T. & G.

7670 COLO Carex amplifolia Boott.

7671 HSU Lunia hypoleuca Benth.

7672 HSU Pellaea brachyptera (T. Moore) Baker

7673 Zauschneria californica Presl. ssp. latifolia (Hook) Keck

7674 Solidago canadensis L. ssp. elongata (Nutt.) Keck

7675 Silene campanulata Wats. ssp. greenei (Wats.) Hitch.

7676 COLO Penstemon corymbosus Benth.

7677 Cercocarpus betuloides Nutt. ex T. & G. var. macrourus (Rydb.) Jeps.

7678 Draperia systyla (Gray) Torr.

7679 Chrysothamnus parryi (Gray) Greene ssp. latior Hall & Clem.

7680 Selaginella wallacei Hieron.

7681 Galium grayanum Ehr.

7682 Eriogonum vimineum Dougl. ex Benth.

7683 Agrostis semiverticillata (Forsk.) C. Chr.

7684 HSU Carex bolanderi Olney

7686 Juncus balticus Willd.

7689 Stephanomeria virgata Benth.

7691 Lonicera ciliosa (Pursh) Poir.

7692 HSU Euonymus occidentalis Nutt. ex Torr.

7693 Brickellia greenei Gray

7694 Garrya fremontii Torr.

7695 Carex subfusca W. Boott.

Summary Table of Forest Statistics for the proposed Trelorita Research Natural Area. Values given are for all plots samples, and are Means and Coefficient of Variation expressed as a percentage of the mean.

Taxon	Basal Area (m^2/ha)	Rel. Dom.	Density (Stems/ ha)	Rel. Dens.	Impt. Val.	$\bar{X}$
Pseudotsuga menziesii	17.5 (188)	21.6 (174)	109. (141)	17.1 (140)	37.0 (131)	23.7 (117)
Abies concolor	14.7 (199)	21.9 (182)	127.3 (201)	18.7 (164)	40.7 (166)	11.7 (181)
Pinus attenuata	4.0 (293)	11.4 (282)	68.5 (300)	21.9 (283)	21.9 (283)	3.1 (282)
Quercus chrysolepis	1.5 (246)	4.7 (222)	136.0 (191)	14.5 (173)	19.1 (179)	3.59 (143)
Quercus garryana	1.5 (308)	8.8 (300)	58.8 (284)	10.0 (250)	17.8 (285)	3.3 (230)
Pinus ponderosa	10.0 (278)	8.7 (257)	17.1 (289)	4.9 (286)	13.6 (268)	11.8 (216)
Pinus sabiniana	3.3 (322)	12.3 (245)	18.3 (287)	2.4 (287)	11.2 (287)	30.1 (100)
Acer glabrum	0.1 (489)	0.2 (490)	38.0 (281)	7.2 (256)	7.4 (257)	0.6 (273)
Alnus rhombifolia	3.2 (379)	5.0 (306)	18.3 (355)	1.8 (333)	6.8 (312)	38.6 (313)
Acer macrophyllum	1.1 (251)	2.3 (358)	38.0 (267)	3.2 (247)	5.9 (238)	4.3 (230)
Arbutus menziesii	1.1 (436)	2.3 (440)	55.1 (476)	3.1 (461)	5.3 (452)	1.4 (364)
Cornus sessilis	0.0 (443)	0.1 (481)	42.8 (325)	4.1 (318)	4.2 (311)	0.3 (303)
Pinus lambertiana	3.8 (398)	2.3 (394)	8.6 (269)	1.1 (307)	3.4 (344)	6.6 (337)
Quercus kelloggii	0.8 (303)	1.2 (356)	15.9 (301)	2.1 (314)	3.3 (313)	2.3 (407)
Cornus nuttallii	0.1 (356)	0.1 (382)	11.0 (374)	1.6 (384)	1.7 (383)	0.5 (360)
Taxus brevifolia	0.0 (510)	0.1 (510)	2.4 (510)	0.2 (510)	0.3 (510)	0.5 (510)

Photo 1. View of the Manzanita Creek watershed from Twin Sisters Mountain.

Photo 2. Typical condition of old-growth stands of Pinus ponderosa in the Manzanita Creek drainage. Predominant understory here is Symphoricarpos, with other taller shrub taxa.

Photo 3. View of Quercus garrayana stands in the Manzanita Creek watershed. Bromus marginatus forms a continuous grassy understory, and typifies the non-seral phase of this vegetation.

Photo 4. Abies concolor-Acer glabrum type forests of the cool, northerly exposures of this region are the climax type forest at higher elevations.

Photo 5. View of the southerly face of Twin Sisters mountain. Quercus vaccinifolia dominated vegetation shown in the lower portion of the scene is seral to forest, while the more open stands above are seemingly non-seral and support dense Cercocarpus betuloides macrourus.

Photo 6: View of the sharp boundary between Abies concolor forest and rocky site habitats with Holodiscus vegetation.